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Health-Related Quality of Life and Sleep Disorders in Taiwanese People with Heart Failure

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Health-Related Quality of Life and Sleep Disorders in Taiwanese People with Heart Failure

by

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Dedication

To My Parents

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Health-Related Quality of Life and Sleep Disorders in Taiwanese People with Heart Failure

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The purposes of this cross-sectional, descriptive, correlational study were to describe the characteristics of sleep disorders and HRQOL; to explore the relationships between individual characteristics (age, gender, education, living arrangement, marital status, financial status, employment status, and type of language), HF characteristics (body mass index, comorbidity, and perceived health), sleep disorders (nocturnal sleep quality, daytime sleepiness, and daytime napping), and HRQOL; and to identify predictors of HRQOL. A nonprobability sample of 125 participants with HF was recruited from the outpatient departments of a large medical center and an affiliated hospital located in southern Taiwan. All participants were individually interviewed by the principal investigator in either a private area within a clinic or in their homes, except for two participants who completed the questionnaires by themselves at locations of their choice.

Overall, the study findings indicated that insomnia (difficulty initiating sleep, maintaining sleep, or both) may be common among the participants. Approximately 72.8% of the participants reported poor nocturnal sleep quality, however, only 30 (24%)

of them had excessive daytime sleepiness. Additionally, the majority (81.6%) of the participants reported they were prone to habitual daytime napping after lunch. Except for the significant relationship between daytime sleepiness and the component of daytime dysfunction, daytime sleepiness and daytime napping were not significantly correlated with the global and componential variables of nocturnal sleep quality.

By using a hierarchical multiple regression model analysis, six predictors were identified from 14 predictor variables, and those six accounted for 58.5% ($p<.001$) of the variance in HRQOL. After controlling for age, education, financial status, comorbidity, perceived health, and NYHA Class, the analyses showed that sleep variables (subjective sleep quality, sleep disturbances, and sleep latency) accounted for 7% of the variance in HRQOL. The study found that the Taiwanese persons with HF who experienced better HRQOL were those who had higher level of education, lower NYHA Classes, and small numbers of comorbid conditions, and reported better subjective sleep quality, fewer sleep disturbances, and shorter sleep latency.

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Chapter 1: Introduction

Chronic heart failure (HF) is a common and major health condition that results in a high rate of rehospitalization, morbidity, and mortality across the world (Heidenreich et al., 2006; Levy et al., 2002; Podrid & Myerburg, 2005; Sanderson & Tse, 2003). HF is characterized by several complex symptoms that are difficult to control, and require long-term clinical management. As a result, people not only suffer from symptoms caused by HF itself, but also from treatment-related side effects. For example, symptom side effects caused by two common medications, beta-blockers and diuretics, include edema, fatigue, hypotension, copious amounts of urine, and electrolyte imbalance. These can affect the ability to carry out daily activities and tasks and also enjoyment of life (Bennett, Cordes, Westmoreland, Castro, & Donnelly, 2000; Hunt et al., 2005; Todero, LaFramboise, & Zimmerman, 2002). As a result, quality of life may be significantly impaired even though they are receiving evidence-based HF treatments (Bennett, Baker, & Huster, 1998; Clark, Tu, Weiner, & Murray, 2003; Ekman, Fagerberg, & Lundman, 2002; Jessup & Brozena, 2003; Westlake et al., 2002). This is also true for Taiwanese people with HF (Shang, 2002; Shih, Chiou, Tsai, Ou, & Jeng, 2003; Wang, 2004; Yang, 2000).

Identifying and ameliorating potential negative factors that could impact patients' health-related quality of life (HRQOL) is imperative to create better long term health-care outcomes for people living with HF. As a composite outcome variable, HRQOL can be used to reflect one's subjective perceptions of the physical and psychosocial functional effects of an illness and consequent therapy on daily activities (Reddy & Dunn, 2000; Wiklund, Lindvall, Swedberg, & Zupkis, 1987). HRQOL has been viewed as the most important clinical outcome to guide effective therapeutic interventions for HF (Hadorn, Baker, Dracup, & Pitt, 1994). However, people with HF are at risk for worsening

HRQOL because of the symptoms and gradual functional decline (Coelho et al., 2005; Masoudi et al., 2004). Research has suggested that HF not only impairs physical functioning, but it also increases psychological distress, including anxiety, feelings of powerlessness, and depression (Bennett et al., 1998; Bennett et al., 2003; Cacciatore et al., 1998; Friedman, 2003; Jalowiec & Grady, 1994; Lackey, 2004; Zambroski, 2003; Zambroski, Moser, Bhat, & Ziegler, 2005).

Sleep disorders have been reported as one of the most burdensome symptoms for people with HF (Jaarsma et al., 1999; Jalowiec & Grady, 1994; Todero et al., 2002; Zambroski et al., 2005). They are more likely to develop sleep problems compared to the general population (Ancoli-Israel et al., 2003; Brostrom, Stromberg, Dahlstrom, & Fridlund, 2004; Katz & McHorney, 2002). Approximately 10 to 70% of patients with HF experience sleep problems (Brostrom et al., 2004; Erickson, Westlake, Dracup, Woo, & Hage, 2003; Jahaveri et al., 1995; Mansfield et al., 2004; Sin et al., 2003; Skobel et al., 2005; Trupp et al., 2004; Villa et al., 2003). However, sleep disorders are one of the least studied correlates of HRQOL in people with HF, and information is especially lacking in Taiwanese people.

The relationship between sleep disorders, HF, and HRQOL needs investigation. Two major causes for sleep disorders in this population are sleep-related breathing disorders and insomnia (Brostrom & Johansson, 2005). Sleep-related breathing disorders represent a complex manifestation of sleep disorders, and a powerful determinant of poor prognosis in people with HF (Rao & Gray, 2005). Insomnia is associated with complaints regarding the quantity, quality or timing of sleep at least 3 times a week for at least one month (Holbrook, Crowther, Lotter, Cheng, & King, 2000), and independently associated with worsened HRQOL almost to the same extent as HF (Katz & McHorney, 2002). Likewise, excessive daytime sleepiness following insomnia has been linked to increased

morbidity and mortality in people with HF (Newman et al., 2000). The limited research that has been done found that sleep disorders reduced the HRQOL of HF patients and their overall functional performance, including daily activities, work productivity, social participation, cognitive and mathematic functions, and psychological well-being (Brostrom et al., 2004; Erickson et al., 2003; Manocchia, Keller, & Ware, 2001; Skobel et al., 2005). There are no studies describing sleep disorders and HRQOL among Taiwanese people with HF. Because HRQOL is rooted in an individual's cultural background (Yu, Lee, & Woo, 2004), cultural differences limit the application of research findings from the Western population to Taiwanese patients with HF. Understanding this interaction between sleep disorders and HRQOL is needed to provide effective care for this population.

Purpose

The purpose of this study was to investigate the relationship between sleep disorders and HRQOL in people with HF in Taiwan. In particular, the study described sleep characteristics, and HRQOL, and explored the relationships between HF characteristics, sleep disorders, and HRQOL.

Background and Significance

HF is a lethal syndrome affecting approximately 5.2 million Americans with 550,000 new cases each year (Hunt et al., 2005; Podrid & Myerburg, 2005; Rosamond et al., 2007). The estimated cost of HF treatment in the U.S. was $33.2 billion in 2007 (Rosamond et al., 2007). According to AHA, people with HF are six to nine times more likely to experience sudden cardiac death than the healthy population (Rosamond et al., 2007). The mortality rate rose 28% between 1994 to 2004, and approximately 20% of patients died within one year after being diagnosed with HF. Furthermore, 80% of men and 70% of women under age 65 who have HF will die within 8 years of diagnosis

(Rosamond et al., 2007).

In Taiwan, HF is a major cause for rehospitalization, and in 2004 accounted for approximately 2% of the total death rate (Taiwan Department of Health, 2005). Precise statistical data for the incidence of HF among Taiwanese people is unknown. However, in a retrospective medical record review study (n=411), researchers reported an in-hospital mortality rate of 7.8%, a six-month post-discharge mortality rate of 7.2%, and a six-month readmission rate of 39.9% (Tseng, 2004).

The incidence of HF in Taiwan is likely to continue rising (Chen, Chang, Cheng, Chen, & Chai, 2003) based on several factors. Numerous conditions are prevalent, such as diabetes, obesity, and smoking, which are known to influence HF development (Bell, 2003; Hunt et al., 2005; Hussey & Hardin, 2003; Wilhelmsen, Rosengren, Eriksson, & Lappas, 2001). Diabetes is the fourth leading cause of death in Taiwanese people and may even be underestimated (Lu, Hsu, Anderson, & Huang, 2005; Taiwan Department of Health, 2006). According to the 1998 and 1999 claims data from the Bureau National Health Insurance program in Taiwan, HF was the most prevalent complication of diabetes (32.9% and 23.3%, respectively) (Lin, Chou, Tsai, Lee, & Tai, 2004).

Second, several heart diseases can cause HF (Hunt et al., 2005; Leung & Bradley, 2001; Lloyd-Jones et al., 2002; Naughton, 2003). In 2005, heart disease was ranked as the third leading cause of all deaths in Taiwan and accounted for 9.3% of the total death rate. Hypertension was the tenth cause leading to 1.4% of the total death rate (Taiwan Department of Health, 2006). In a chart review study, the primary cause of HF was ischemic heart disease, including coronary artery disease and myocardial infraction, affecting approximately half of 411 Taiwanese people with HF (Tseng, 2004). Additionally, aging is an important risk factor for the increasing incidence and mortality rates of HF in Chinese populations (Hung, Cheung, Ip, & Fung, 2000; Hunt et al., 2005;

Masoudi, Havranek, & Krumholz, 2002). The Taiwanese population over age 65 years reached 9.5% in 2005 and is expected to continue to increase in the future (Taiwan Department of Health, 2005).

Symptom burden in HF causes devastating physical and psychosocial functioning and poor HRQOL (Heo, Moser, Riegel, Hall, & Christman, 2005; Johansson, Dahlstrom, & Brostrom, 2006; Kasper, 2003). Patients report lacking energy and facing marked restrictions on performing daily activities including working, social participation, self-care activities, and household chores (Bosworth et al., 2004; Carlson, Riegel, & Moser, 2001; Riegel & Carlson, 2002; Zambroski et al., 2005). Challenges include having to modify their environments, adhere to HF treatments, and adapt to new limitations (Riegel & Carlson, 2002; Scotto, 2005). Symptom burden can lead to significant psychosocial distress, including uncertainty, role loss, and depression (Bosworth et al., 2004; De Jong, Moser, & Chung, 2005; Friedman, 2003; Zambroski, 2003; Zambroski et al., 2005).

Advanced and aggressive HF treatments have improved mortality rates, however, people living with HF still bear a high level of uncertainty of prognosis, particularly those who live longer (Levy et al., 2002; Tendera, 2004). There has been increased attention to improving patients' HRQOL while prolonging their length of life. Research studies have found that patients with symptomatic HF often chose HRQOL over prolonging their lives (Lewis et al., 2001; Stanek, Oates, McGhan, Denofrio, & Loh, 2000). Some patients agreed to take potentially life-threatening medications in an effort to improve their HRQOL (Rector et al., 1995).

HRQOL has been viewed as an important predictor of disease severity, responsiveness to treatment, development of depressive symptoms, utilization of resources, cardiovascular risk, and deaths and hospitalizations for HF (Hauptman et al.,

2004; Havranek, Spertus, Masoudi, Jones, & Rumsfeld, 2004; Masoudi et al., 2004; Shin et al., 2001; Soto, Jones, Weintraub, Krumholz, & Spertus, 2004; Stull, Clough, & Van Dussen, 2001). It is vital that researchers evaluate HRQOL when people are diagnosed with HF and throughout the trajectory of this chronic illness, and develop effective interventions to ameliorate symptoms, improve psychosocial functioning, and maximize functional capabilities (Jenkinson, 1994; Yu et al., 2004).

Because HRQOL is such a complex concept comprising a wide range of needs within a physical, psychosocial, and cultural context (Fayers & Machin, 2000; Haas, 1999; Johansson et al., 2006; Sredl, 2004; Steinhauser et al., 2002), more research to identify correlates of better HRQOL among people with HF is needed. In Taiwan, some studies have examined the relationships between HRQOL and factors including dyspnea, exercise tolerance, coping skills, social support, and self-care among people with HF (Cheng, 2004; Shang, 2002; Shih et al., 2003; Wang, 2005; Wang, 2004; Wang, 2003; Yang, 2000). However, information about sleep disorders and HRQOL is lacking.

Recent studies have linked sleep to HRQOL in Western people with HF (Brostrom & Johansson, 2005; Johansson, Agnebrink, Dahlstrom, & Brostrom, 2004; Manocchia et al., 2001; Skobel et al., 2005). Most researchers describe patients' sleep disorders in this population within the context of sleep-related breathing disorders (Brostrom & Johansson, 2005; Cormican & Williams, 2005; Parker & Dunbar, 2002). There are two major types of sleep-related breathing disorders in people with HF: obstructive sleep apnea syndrome (OSA) and Cheyne-Stokes respiration with central sleep apnea (CSR-CSA) (Lanfranchi & Somers, 2003; Spieker & Motzer, 2003). When OSA occurs, the upper airway is repeatedly obstructed or partially obstructed during sleep (Trupp, 2004). Approximately 10% to 36 % of people with HF have OSA (Caples, Gami, & Somers, 2005; Sin et al., 2003). In contrast, CSR-CSA occurs as a result of an absence or a reduction of ventilatory

effort during non-rapid-eye movement sleep (American Academy of Sleep Medicine, 1999; Trupp, 2004). The CSR-CSA condition is more likely to occur in HF patients with left ventricular ejection fractions (LVEF) less than 45% (systolic HF) (Jahaveri et al., 1995). Researchers reported that the prevalence of CSR-CSA in people with HF ranges from 23% to 37% (Javaheri, 2006; Skobel et al., 2005). Some people developed a mixed type of sleep apnea with components of both OSA and CSR-CSA (Cormican & Williams, 2005; Lanfranchi & Somers, 2003; Rao & Gray, 2005; Spieker & Motzer, 2003).

Sleep-related breathing disorders may actually accelerate the deterioration of cardiac function. Generally, OSA is identified as a risk factor for developing HF, whereas CSR-CSA is recognized as a consequence of HF (Lanfranchi & Somers, 2003; Yamashiro & Kryger, 1993). Recently, however, there has been increasing interest in the role that HF might play in causing the development of OSA. Two possible mechanisms for this are: (1) HF-related periodic breathing could undermine the respiratory tract and contribute to its collapse; and (2) edema in the soft tissues of the neck and pharynx caused by fluid retention and HF-dependent edema could constrict the upper airway and exacerbate the collapse (Leung & Bradley, 2001; Ventura, Potluri, & Mehra, 2003).

More research is needed to explore the nature of sleep in people with HF. Insomnia may be prevalent in people with HF but the research on this topic is limited. Insomnia indicates an inability or difficulty with sleeping, and is characterized by sleep complaints including difficulty initiating, maintaining sleep, or both (Holbrook et al., 2000). Up to 70% of people with HF report sleep complaints (Brostrom et al., 2004; Erickson et al., 2003). They reported their sleep interruptions caused by several HF symptoms, including orthopnea, paroxysmal nocturnal dyspnea, cough, palpitations, and nocturia (Brostrom, Stromberg, Dahlstrom, & Fridlund, 2001). The most common nocturnal sleep complaints were inability to sleep flat, difficulties initiating and

maintaining sleep, and early awakening (Brostrom et al., 2004; Erickson et al., 2003; Lainscak & Keber, 2003). Excessive daytime sleepiness may follow insomnia (Brostrom et al., 2004) and further impair people's general health, work activities, cognition, and memory (Asplund, 1996; Bixler et al., 2005). Daytime sleepiness is associated with increased morbidity and mortality of cardiovascular disease including myocardial infarction and HF (Newman et al., 2000). Likewise, nocturnal sleep greater than eight hours is related to increased mortality (Kripke, Garfinkel, Wingard, Klauber, & Marler, 2002; Youngstedt & Kripke, 2004). Excessive sleep may not be helpful to the restoration of damaged myocardium.

Recognition of sleep disorders in the HF population, thus, is extremely important in order to guide early diagnostic evaluations for any sleep disorders, including OSA and CSR-CSA, as well as treatment of the HF condition (Principe-Rodriguez, Strohl, Hadziefendic, & Pina, 2005). Improving sleep may also improve functional capacity and mental health in people with HF, and may help them to achieve a better HRQOL (Principe-Rodriguez et al., 2005; Redeker & Hilkert, 2005).

Outcomes from this study will provide empirical data about sleep disorders in Taiwanese people with HF. Sleep has been overlooked in the Chinese society (Lee, 1995; Lee, 2006). In comparison with Korean and Japanese population, Taiwanese people have reported a higher prevalence of insomnia (Nomura, Yamaoka, Nakao, & Yano, 2005). Taiwanese people tend to attribute sleep problems to physical diseases caused by the imbalance of yin and yang and disharmony with nature (Lee, 1995), thus, not sleeping well may be considered reasonable and natural. As a result, they may engage in few actions to deal with their sleep problems (Wang, 2005). Based on the evidence that sleep-related breathing disorders may contribute to the development of HF, and HF can cause sleep disorders (American Academy of Sleep Medicine, 1999; Leung & Bradley,

2001), this Chinese belief may put people at the risk for developing HF.

Information from this study may help nurses design effective patient teaching program and interventions to improve sleep condition and HRQOL in people with HF. Understanding correlates of HRQOL is important for nurses to help patients identify factors that can cause sleep disorders and worsen HROQL and to provide more effective care to meet their needs. By designing educational programs about HF, sleep disorders, and HRQOL, nurses can help patients and their families to cope better with their disease, sleep problems and thus to maintain a better HRQOL.

This study will contribute to a better understanding of sleep disorders and HRQOL. Although several studies about sleep disorders and HRQOL in people with HF have been done, few studies reflect a nursing science perspective. Because research is lacking to describe sleep disorders and HRQOL in Taiwanese people living with HF, the study will enhance knowledge to guide effective interventions.

Conceptual Model

The conceptual framework for the study is based on the concept of health-related quality of life (HRQOL) (see Figure 1). The term "HRQOL" is derived from the concept of quality of life (QOL). Researchers contend that QOL is a broad concept that consists of all perspectives of life including health, jobs, recreation, finances, culture, rights, values, beliefs, and aspirations (Guyatt, Feeny, & Patrick, 1993; US Department of Health and Human Services, 2000). Although QOL is not a well-defined term, it has been widely used in different disciplines such as nursing, medicine, sociology, and economics (Farquhar, 1995). Investigators usually define QOL based on their unique purposes and situations, thus further confusing its meaning (Dijkers, 1999; Sartorius, 1987). Usually, QOL refers to an individual's general perception of happiness and satisfaction with her/his life and environment (Calman, 1987; Ferrans, 1996; Meeberg, 1993; Oleson, 1990;

US Department of Health and Human Services, 2000). Three concept analyses of QOL identified it as a multidimensional concept that consists of both objective and subjective indicators (Haas, 1999; Kleinpell, 1991; Meeberg, 1993). Domains of QOL includes health, physical, psychological, social, family, economic, and spiritual domains (Ferrans, 1996; Haas, 1999; Juarez, Ferrell, & Borneman, 1998). Although a general agreement on a definition is lacking, the consensus is that QOL has varied meaning in different cultures and populations (Calman, 1987; Fayers & Machin, 2000).

Ware (1987) argued that QOL is a broader concept than health and disease. To address the direct impact of health and illness on QOL, HRQOL is considered a more specific indicator of QOL within the context of health (Aaronson, 1990; Berry & McMurray, 1999; Farquhar, 1995). HRQOL originated from the World Health Organization (WHO) Constitution's (1948) definition of health: "Health is a state of physical, mental, and social well-being and not merely the absence of disease or infirmity" (Power, 2003). The definition of health has been extended to include HRQOL (Barbette, Guillemin, Chau, & the Lorhandicap Group, 2001).

HRQOL is conceptualized based on the social science paradigm concerned with individuals' perceptions of daily functioning and overall well-being with attention to their behaviors and feelings (Wilson & Cleary, 1995). This is different from the traditional biomedical paradigm that primarily focuses on clinical markers to guide diagnosis and treatment of diseases. Researchers have suggested that HRQOL should be expanded from objective evidence of the effect of illness and treatment to include the individuals' subjective perceptions and experiences (Montazeri, Gillis, & McEwen, 1996; Oleson, 1990). Therefore, HRQOL can be used to reflect people's perceptions of the degree of functioning in their daily lives (van der Steeg, De Vries, & Roukema, 2004).

HRQOL is a broad, multidimensional, and dynamic concept. Not all researchers

agree on the domains of HRQOL. Whether or not an illness and consequent treatments restrict a person's ability to perform a normal role in daily activities is a consideration. Researchers have suggested that several areas including symptoms, physical domain, psychosocial functioning, and functional status should be considered the domains of HRQOL (Aaronson, 1988; Bosworth et al., 2004; Green, Porter, Bresnahan, & Spertus, 2000; Hawthorne & Hixon, 1994; Leidy, Rentz, & Zyczynski, 1999; Schipper, Clinch, & Olweny, 1996; Spilker, 1996; Wilson & Cleary, 1995). However, some researchers have argued that HRQOL should consider income, freedom, future expectation, personality, and quality of environment (Guyatt et al., 1993; Sredl, 2004), while others contended that opportunities, education, freedom, jobs, housing, economy, religion, and social security are indirectly affected by diseases and treatments (Schipper et al., 1996; Ware, 1987). Some characteristics, such as subjective well-being, spiritual, and life satisfaction, can be affected by several factors such as job satisfaction, socioeconomic status, thus, they should be considered as influencing factors rather than domains of HRQOL (Ormel, Lindenberg, Steverink, & Vonkorff, 1997; Wilson & Cleary, 1995). Similarly, perceived health can affect perception of HRQOL (Heo et al., 2005; Johnson & Wolinsky, 1993; Ware, 1987; Wilson & Cleary, 1995).

Clear agreement about theoretical perspectives on HRQOL is somewhat problematic because the concept has multiple interpretations and definitions (Fayers & Machin, 2000; Ferrans, Zerwic, Wilbur, & Larson, 2005). There are four different perspectives of HRQOL: (1) HRQOL is a holistic concept with several domains including physical and psychosocial well-being, environment, and overall life satisfaction (Guyatt et al., 1993; Sredl, 2004); (2) HRQOL is an individual's perception of the gap between the expectation of health and the actual experience of it (Carr, Gibson, & Robinson, 2001; Spertus et al., 2005; Steinhauser et al., 2002); (3) HRQOL is an individual's perceptions

of his/her limitations on daily functioning affected by diseases, impairments, and treatments (Bowling, 2003; Cooley, 1998; Patrick & Chiang, 2000; Reddy & Dunn, 2000; Schipper et al., 1996; Sredl, 2004); and (4) HRQOL is the improvement of symptoms, well-being, and daily functioning (Wiklund et al., 1987).

Johansson and colleagues (2006) reviewed 58 quantitative HRQOL studies in people with HF and concluded that HRQOL was negatively influenced by HF symptoms and functional capability. Several factors, particularly individual characteristics, such as age, gender, and personality, have to be taken into consideration because different perspectives might exist regarding the components of a good HRQOL. Decreases in the physical and social domains of HRQOL may result in feelings of loss of control and further cause emotional responses, such as anxiety and depression. In addition, sleep disturbances have a negative effect on HRQOL (Johansson et al., 2006).

Sleep has been viewed as a facet in the physical health domain of QOL (The WHOQOL Group, 1998). Adequate sleep is essential for biological and mental restoration, protection, integration, and memory, not merely time out from daily living (Bootzin, Lahmeyer, Lilie, Hanawalt, & Shaver, 1994; Hodgson, 1991). Therefore, a good quality of sleep is associated with good health (Manocchia et al., 2001) and psychological well-being (Ford & Cooper-Patrick, 2001).

The term sleep architecture is used to describe the components of sleep. It is constructed into six stages including periods of wakefulness, four-stages of non-rapid-eye movement (NREM), and rapid-eye movement (REM), creating several sleep cycles during normal sleep (Bootzin et al., 1994). During NREM sleep, the reduced metabolic rate increases parasympathetic nervous system tone, decreases sympathetic nervous system activity, and activates baroreflex sensitivity, resulting in decreases in heart rate, blood pressure, stroke volume, cardiac output, and systematic vascular resistance (Leung

& Bradley, 2001; Rao & Gray, 2005; Trupp, 2004). The greatest relaxation of the cardiac workload occurs during REM sleep (Trupp, 2004). Thus, sleep is normally a period of cardiac rest (McEvoy, 2004). In addition, sleep is required for adequate functioning in daytime. Research has suggested that NREM sleep is important to consolidate memory for facts, while REM sleep is crucial to help maintain mental health (Harvard Medical School, 2006).

Sleep disorders can disrupt cardiovascular, respiratory, and automatic regulation, resulting in a high rate of HF morbidity and mortality (Kripke et al., 2002; Leung & Bradley, 2001; Newman et al., 2000; Youngstedt & Kripke, 2004). People with HF may experience insomnia (sleeplessness), hypersomnia (sleepiness), or both, which could interact to create a vicious cycle. For example, people suffering from low cardiopulmonary tolerance and fatigue may demand extra daytime sleep and longer nocturnal sleep to restore energy. Excessive daytime sleep, however, can interrupt the patient's circadian rhythm and shorten nocturnal sleep, resulting in sleep fragmentation and reduced amounts of total sleep (Lainscak & Keber, 2003; Youngstedt & Kripke, 2004). Subsequently, sleep disorders can interrupt daily activities, resulting in poor HRQOL in people with HF. Figure 1 illustrates the major concepts of HRQOL and sleep disorders that were investigated in the present study.

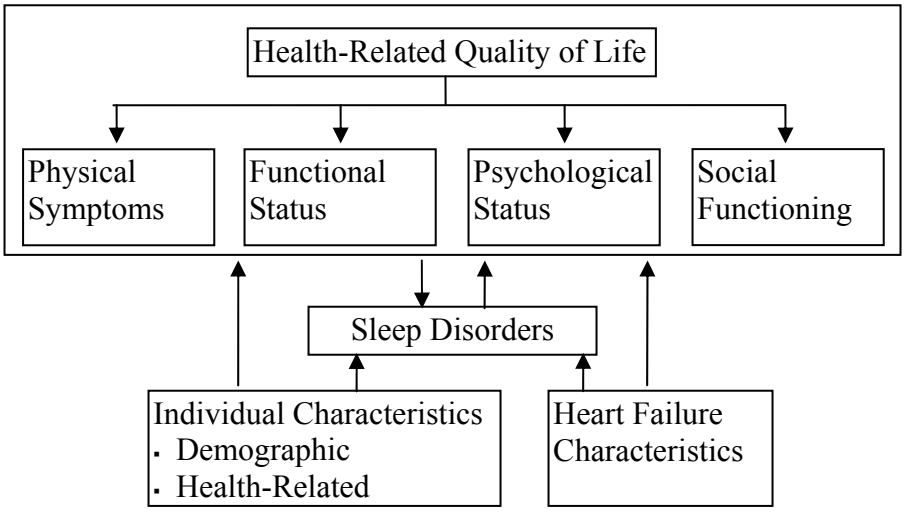

Figure 1. Conceptual Model for Health-Related Quality of Life and Sleep Disorders.

In this model, HRQOL includes 4 domains: physical symptoms, functional status, psychological status, and social functioning. The concept of sleep is viewed as a correlate of HRQOL. Sleep disorders include various sleep situations, such as, sleep disruption, prolonged sleep latency, and extended sleep duration, occurring in either nighttime or daytime sleep. When sleep problems occur, however, they can affect people's HRQOL. This conceptual model depicts a functional relationship between HRQOL and sleep disorders-- the fewer the sleep disorders, the higher the HRQOL. Both sleep disorders and HRQOL can be affected by individual characteristics and HF characteristics.

In summary, this conceptual framework about HRQOL provided a guide for the study. The effects of sleep disorders on HRQOL in people living with HF need study.

Research Questions

The research questions for the study were:

1. What sleep characteristics are reported by Taiwanese people living with HF?
2. What are the perceptions of HRQOL and health among Taiwanese people living with HF?
3. What are the relationships between HRQOL, sleep disorders, HF characteristics

(prescribed HF medications, duration of HF diagnosis, type of HF, New York Heart Association Functional Classification, and left ventricular ejection fraction), and individual characteristics including demographics (age, gender, education, living arrangement, marital status, financial status, employment status, and type of language) and health-related characteristics (body mass index, comorbidity, and perceived health)?

4. What are the predictors of HRQOL among Taiwanese people with HF?

Definitions of Terms

The following definitions were used in the study.

1. Heart Failure: a complex, chronic condition in which the ventricles are unable to efficiently fill with and/or eject sufficient blood to meet metabolic needs of the body (Hunt et al., 2005; Tendera, 2004). Because not all patients exhibit signs of fluid overload, the term "heart failure" is preferred over the traditional term "congestive heart failure" (Hunt et al., 2005). The diagnosis of HF was made by a physician and obtained from the medical records.
2. Heart Failure Characteristics: five components including prescribed HF medications, duration of HF diagnosis, type of HF, New York Heart Association Functional Classification (NYHA) (The Criteria Committee of the AHA, 1994), and left ventricular ejection fraction (LVEF).
   (1) Prescribed HF medications: the number and type of prescribed HF medications. Data were obtained from the medical records.
   (2) Duration of Heart Failure Diagnosis: the time since the initial diagnosis of HF. Data were collected from the participants and medical records.
   (3) Types of Heart Failure: include diastolic, systolic, and valvular dysfunction. Generally, a LVEF less than 40% indicates systolic dysfunction and greater than

50% as diastolic dysfunction (Hunt et al., 2005). Valvular dysfunction refers to the HF that is primarily caused by valvular abnormality and difficult to differentiate it from either diastolic or systolic HF (Patel & Konstam, 2001). Data were obtained from the physicians or medical records.

(4) New York Heart Association Functional Classification (NYHA): a subjective evaluation by healthcare providers, which places people into one of four functional classes (Kasper, 2003; Subramanian et al., 2005). Class I indicates people with heart disease who have no limitation in engaging in ordinary daily activity. Class II denotes people whose ordinary daily activity is slightly restricted by heart disease symptoms. They are comfortable at rest; however, ordinary activity may result in fatigue, palpitations, dyspnea or angina. Class III consists of people whose ordinary daily activity is markedly restricted by heart disease. They are comfortable at rest, but very minimal activity exertion results in aggravating symptoms. Class IV indicates people who have difficulty performing any daily activities. Symptoms of heart disease are present even at rest and any activity will cause discomfort (Kasper, 2003; Subramanian et al., 2005). Data were collected from physicians and medical records.

(5) Left Ventricular Ejection Fraction (LVEF): the percentage of end-diastolic left ventricular volume that is ejected per beat (Ganong, 1999). A LVEF of less than 40% indicates systolic dysfunction with more severe HF and symptoms (Hunt et al., 2005). The data were obtained from the medical records with LVEF derived from either echocardiogram or cardiac catheterization.

3. Individual Characteristics: included demographics and health-related characteristics.

(1) Demographic characteristics: consisted of age, gender, education, living arrangement, marital status, financial status, and employed status. Demographic

characteristics have been related to HRQOL (Lai et al., 2005) and sleep disorders in Taiwanese people (Chen, Kawachi, Subramanian, Acevedo-Garcia, & Lee, 2005). People with different characteristics may have varied perspectives and values regarding sleep disorders and HRQOL (Bootzin et al., 1994; Erickson et al., 2003; Johansson et al., 2006).

(2)Health-related characteristics: comprised of body mass index, comorbidity, and perceived health.

A). Body mass index: is a measure of body fat based on body height and weight that applies to both adult men and women (National Heart Lung and Blood Institute, 2006). High body mass index is an independent factor for development of HF (Wilhelmsen et al., 2001) and sleep apnea (Principe-Rodriguez et al., 2005). Body mass index was calculated from self-reported weight (kg)/height^2 (m^2).

B). Comorbidity: is the condition of having two or more diseases at the same time. It includes the number and seriousness of the comorbid condition(s). Data were collected using the self-reported Charlson Comorbidity Index (Katz, Chang, Sangha, Fossel, & Bates, 1996) and a chart-review list of concomitant health problems adapted from the American College of Cardiology/American Heart Association Task Force on Clinical Data Standards (Radford et al., 2005).

C). Perceived Health: individuals' overall evaluation of their existing health status. Perceived health is essential for determining HRQOL (Albrecht, 1994). It is an individual's integration of all of the various aspects of health (Ferrans et al., 2005). Perceived health was measured using the modified Self-Rated Health Subscale (SRHS) (Lawton, Moss, Fulcomer, & Kleban, 1982).

4. Health-Related Quality of Life (HRQOL): an individual's perception of her/his daily functioning impacted by HF and its consequent treatments, and the evaluation of the

degree of functional limitations on physical and psychosocial functioning. HRQOL was measured using the Kansas City Cardiomyopathy Questionnaire (KCCQ) (Green et al., 2000). HRQOL consisted of four domains in this study.

(1) Physical symptoms: unpleasant physical feelings. Perceived physical symptoms are very individualized. Symptoms may reflect the effects of treatments and the necessity for patients to change their activities (Wenger, 1989). They also may affect functional capacity, psychosocial functioning, and perceived health status (Johansson et al., 2004; Smith, Avis, & Assmann, 1999; Wenger, 1989). Physical symptoms were measured using the symptom subscales of the Kansas City Cardiomyopathy Questionnaire (Green et al., 2000).

(2) Functional status: an individual's ability to carry out usual daily activities, roles, and tasks, including self-care, physical, and role activities. Functional status was measured using the physical subscale of the Kansas City Cardiomyopathy Questionnaire (Green et al., 2000).

(3) Psychological Status. Psychological status includes both negative affect, as being discouraged, as well as positive affect such as enjoyment and satisfaction with life. Impairment of psychological functioning can result in the inability to perform tasks that require psychological health including dealing with difficulties and making decisions (Bosworth et al., 2004; Wilson & Cleary, 1995). Psychological status is particularly important because of the Chinese belief that psychological status has a mutual influence with physical status (Yu et al., 2004). Psychological status was measured using the QOL subscale of the Kansas City Cardiomyopathy Questionnaire (Green et al., 2000).

(4) Social Functioning: the ability to maintain person-to-person interactions with family and friends (Cooley, 1998). Functional limitations can preclude patients

from maintaining normal social activities (Aaronson, 1988). Positive interpersonal relationships help people cope with stress and difficulties caused by HF and its treatments. However, negative interpersonal relationships can be harmful (Bosworth et al., 2004). Social functioning was measured using the social limitation subscale of the Kansas City Cardiomyopathy Questionnaire (Green et al., 2000).

5. Sleep characteristics: consisted of nocturnal sleep quality, daytime sleepiness, and daytime napping. Sleep characteristics were used to reflect sleep disorders in which individuals perceived they had poor nocturnal sleep quality and complaints of excessive daytime sleep. Excessive daytime sleepiness is identified as a symptom accompanying nocturnal sleep disorders.
   (1) Nocturnal sleep quality: an individual's perception of their overall sleep aspects, including quality, duration, latency, efficiency, sleep disturbances, use of sleep medication, and daily dysfunction. Poor sleep quality is reflected by symptoms of sleep disorders. Nocturnal sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI) (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). Participants with a global score of PSQI greater than 5 will be identified as poor sleepers.
   (2) Daytime Sleepiness: an individual's evaluation of the propensity to fall asleep in daily sedentary situations, such as while sitting and reading, watching TV, riding as a passenger in a car, and sitting quietly after lunch . Daytime sleepiness is different from daytime somnolence or drowsiness (Lai et al., 2005). Excessive daytime sleep primarily reflects whether sleep onset occurs at inappropriate settings and times, such as, working and driving. Daytime sleepiness not only affects work activities, social and marital life, and mood, but also results in a negative socioeconomic

impact, such as, car accidents and falling asleep during working (Gander, Marshall, Harris, & Reid, 2005; Ohayon, Caulet, Philip, Guilleminault, & Priest, 1997). In comparison with nighttime sleep disorders, daytime sleepiness might be a more important indicator of mortality and cardiovascular disease (Newman et al., 2000). Daytime sleepiness was measured using the Epworth Sleepiness Scale (Johns, 1991). A score greater than 10 indicates excessive daytime sleepiness.

(3) Habitual Daytime Napping: an individual's habituation to take daytime naps after lunch or in afternoon. Habitual daytime napping is different from daytime sleepiness. Taking a 20-60 minutes nap after lunch is common and helpful for a better nocturnal sleep in Taiwanese people (Lai, 2005). In contrast, daytime sleepiness may indicate daytime fatigue and emotional distress (Edelll-Gustaffson, 2002). Habitual daytime napping was measured using three additional items regarding prevalence, frequency and duration of daytime napping.

Assumptions

The following assumptions were made for the study:

1. Individuals are the best evaluators of their own HRQOL (Ferrans, 1996).
2. A person's perception of HRQOL may affect their choices of HF treatments.
3. Sufficient sleep is essential to the restoration of a damaged myocardium.

Limitations

1. The generalizability of the study findings was limited because the study used a nonprobability sample and cross-sectional design that highlights associations, but not a causal relationship.
2. Since the data were collected from one medical center and its affiliated hospital located in southern Taiwan, the study findings may not able to reflect the situations of the patients who were living in other areas of Taiwan.

3. The lack of objective sleep measurement data using laboratory devices and diagnostic criteria limited the ability to identify and diagnose sleep disorders.
4. The findings may reflect a response bias in that people who were interested in the study topic may have been more likely to participate.
5. Some people may have participated in the study because it was socially desirable since their own physicians recommended this study.
6. Selection bias may be an issue of this study because participants were referred by a senior cardiologist. The actual refusal rate is unknown.
7. The low Cronbach's alpha for the SRHS limited the interpretability of the findings about perceived health.

Summary

This chapter provided an introduction to the proposed study, including background and significance, conceptual framework, research questions, definitions of terms, assumptions, and limitations. The purpose of this study was to describe sleep characteristics and HRQOL in Taiwanese people with HF, and to examine the relationships between HF characteristics, sleep disorders, and HRQOL. A conceptual model developed for this study was described. Recognition of sleep disorders in the HF population is extremely important to guide early diagnostic evaluations. HRQOL is a useful outcome measure in both clinical practice and research. Nurses can provide effective care needs of the patients based on their self-report data. The study enhances knowledge to guide effective nursing interventions aimed at helping Taiwanese people with HF improve their HRQOL.

Chapter 2: Literature Review

This chapter provides a review of current literature to support this study. Topics include the following: an overview of HF including the clinical signs and symptoms, classifications, pathophysiology, and evidence-based management; HRQOL in HF; sleep disorders in HF; and the relationship between HRQOL and sleep disorders in people living with HF. Research studies describing findings about HROQL in both Western and Taiwanese people with HF and sleep disorders in Western HF population are also included.

Overview of Heart Failure

HF is a clinical syndrome caused by any structural or functional cardiac impairment that hinders the ventricles to relax to adequately fill with blood or to pump sufficient cardiac output to maintain systematic perfusion to meet the metabolic needs of the tissues (Hunt et al., 2005). It is characterized by a complex signs and symptoms, including fluid retention, fatigue, and shortness of breath, especially on exertion (Heart Failure Society of America, 2006). Although the development of HF is generally a progressive process, patients may suffer from several episodes of acute worsening (acute HF syndrome), resulting in unplanned hospitalizations or emergency room and physicians visits during the trajectory of HF (Gheorghiade et al., 2005; Nieminen & Harjola, 2005). Additionally, symptoms of HF can further impair people's functional capacity and quality of life.

The incidence of HF increases with age (Hunt et al., 2005). In a 5-year follow-up study in UK, the annual incidence of HF per 1000 ranged from 2.5 in middle-aged adults (57 to 60 years) up to 22.4 in older females (≧80 years) and 28.2 in older males (≧80 years old) (van Jaarsveld et al., 2006). In addition, the mortality at higher ages (≧76 years) was 2.1 time more likely than people who were younger. The high prevalence of

hypertension, coronary artery disease, obesity, and diabetes in older adults relates to this epidemic (Young, 2004). Indeed, the HF care has shifted from the view that HF is a dominant condition to a new paradigm that addresses HF as one of several comorbid conditions (Havranek, Masoudi, Rumsfeld, & Steiner, 2003). Treating associated comorbidity, thus, is important and necessary to postpone the appearance of left ventricular dysfunction.

HF is categorized to either systolic or diastolic dysfunction. This classification considers normal systolic function and normal LVEF to be the same (Heart Failure Society of America, 2006). Traditionally, HF was viewed as synonymous with reduced left ventricular contractility or diminished LVEF less than 40% (systolic dysfunction) (Remme & Swedberg, 2001). However, recent research studies have found that approximately 20 to 60% of patients with HF have preserved systolic function with a normal LVEF but still suffer from severe signs and symptoms of HF (Hunt et al., 2005; Jessup & Brozena, 2003; Mann, 1999; Masoudi et al., 2002; Tseng, 2004). These patients have diastolic HF.

Systolic dysfunction results from decreased chamber wall motion causing elevated diastolic filling pressure (preload), reduction in stroke volume and cardiac output, and an elevated systemic vascular resistance (afterload) (Carelock & Clark, 2001; Hunt et al., 2005). Systolic HF is often manifested with ventricle dilation and LVEF less than 40% (Heart Failure Society of America, 2006; Hunt et al., 2005). The dilated ventricle and changes in papillary muscle structure further cause functional heart valve problems including mitral and tricuspid regurgitation (Francis & Tang, 2003). The most common causes of systolic dysfunction include myocardial infarction, ischemic heart disease, coronary artery disease, and hypertensive heart disease (Saul & Shatzer, 2003).

Diastolic HF is characterized by an impairment of ventricular relaxation that

results in elevated ventricular filling pressure with normal left ventricular volume and contractility (Hunt et al., 2005). Because such hearts contract normally, the LVEF is normal or higher (Braunwald, 1997; Jessup & Brozena, 2003). However, the impaired myocardial relaxation can further stiffen the ventricle. As a result, elevated diastolic pressure increases venous tone and arterial stiffness, both of which can further increase left atrial and pulmonary venous pressures, and may result in pulmonary and/or system congestion and even a reduction of cardiac output (Aurigemma & Gaasch, 2004). Most people with diastolic HF, however, eventually develop impaired systolic function (Braunwald, 1997; Hunt et al., 2005; Remme & Swedberg, 2001).

Diastolic HF is usually accompanied by another heart condition, such as restrictive, infiltrative or hypertrophic cardiomyopathy, as well as uncorrected valvular disease, such as aortic stenosis or mitral regurgitation (Braunwald, 1997; Hunt et al., 2005). In general, diastolic HF is most prevalent among elderly women and people who have comorbidities, such as hypertension, diabetes mellitus, coronary artery disease, or atrial fibrillation (Aurigemma & Gaasch, 2004; Hunt et al., 2005; Sander, Wilklow, & Giles, 2004; Tresch & McGough, 1995). Although diastolic HF causes fewer cardiac incidents and medical procedures than systolic HF, the long term costs and resource use for HF are similar (Liao et al., 2006).

Clinical Signs and Symptoms of Heart Failure

The progression of HF causes a constellation of signs and symptoms. Generally, patients experience at least one of three major clinical manifestations (Hunt et al., 2005): (1) no symptoms or symptoms of another cardiac or non-cardiac disease, such as, diabetes, arrhythmia, and acute myocardial infarction; (2) dyspnea and fatigue, which may restrict exercise tolerance; or (3) fluid retention, which may result in pulmonary congestion and peripheral edema. Symptoms in early stage of HF may be subtle. Patients

may initial experience fatigue and intolerance to carry out usual daily activities. The onset of shortness of breath may progress from exertion-related to dyspnea on mild activity. Other cardinal signs and symptoms of HF may include Cheyne-Stokes respirations, pulmonary rales or wheezes, neck vein distention, and the third heart sound. The development of paroxysmal nocturnal dyspnea and Cheyne-Stokes respirations can waken people from sleep (Carelock & Clark, 2001; Greenberg, 2002; Hunt et al., 2005).

Because the heart is unable to provide sufficient blood supply to a variety of vital organs and systems, including renal, brain, lung, and autonomic systems, patients may also encounter symptoms such as, decreased urine output, cough, sleep disturbances, depression, and cognitive impairment (Clark & McDougall, 2006; Johansson et al., 2006). The most distressing symptoms reported by HF patients are dyspnea, fatigue, weakness, sleeping difficulty, edema, orthopnea, poor appetite, paroxysmal nocturnal dyspnea, and cough (Bennett et al., 1998; Friedman, 2003; Grady, Jalowiec, & White-Williams, 1996; Zambroski et al., 2005).

Classifications of Heart Failure

The New York Heart Association (NYHA) Functional Classification is most commonly used by clinicians and researchers (The Criteria Committee of the AHA, 1994). This classification system was constructed as NYHA Class I, II, III, and IV on the basis of people's limitations in daily activities caused by cardiac symptoms. The higher classes indicate more severe functional limitations. Both NYHA functional Class III and IV have been viewed as indicative of advanced HF, and as a predictor of rehospitalization in advanced HF patients (Adams & Zannad, 1998; Van Cheng, 2001). Although cardiac function is impaired in people with NYHA Class I HF who have no limitation in daily activities, they may not aware that HF is life threatening and thus, not adhere to treatment (Greenberg, 2002; Remme & Swedberg, 2001). Receiving treatment is necessary for all

people with HF.

In 2001, the American Heart Association (AHA) and American College of Cardiology (ACC) developed a new staging system for classification of HF (Hunt et al., 2001). The development and progression of HF is classified into four stages. People in stage A and B are recognized as those who are at high risk for developing HF. Stage A includes people without structural heart disease or symptoms of HF, for example, those with hypertension, diabetes, obesity, metabolic syndrome, using cardiotoxins, or sleep-breathing disorders. Stage B denotes people who have structural heart disease, including previous myocardial infarction, left ventricular remodeling, and asymptomatic valvular disease, but without signs or symptoms of HF. Stage C includes those with structural heart disease with prior or current symptoms of HF, and stage D denotes people with refractory HF requiring treatments (Hunt et al., 2005). Once HF is diagnosed, the severity of symptoms in people who are in stage C and D should be assessed to guide therapy.

Pathophysiology of Heart Failure

The progressive nature of HF reflects a complex, interrelated combination of cardiac structural, functional, biological, genetic, and environmental alternations (Jessup & Brozena, 2003; Mann, 1999). Regardless of whether the HF is caused by systolic or diastolic dysfunction, the reduced cardiac output activates a number of complicated but interrelated compensatory mechanisms, including activation of the renin-angiotensin-aldosterone system (RAAS), stimulation of the sympathetic nervous system (SNS), and a complex neuroendocrine response (Parmley, 1992; Saul & Shatzer, 2003). Although these mechanisms are initially helpful to the recovery of the cardiovascular system, they create a vicious cycle on the progression of HF (Piano & Prasun, 2003).

Three models are most often used to illustrate the cause, progression, and the compensatory mechanisms of HF (Jessup & Brozena, 2003; Mann, 1999; McMurray & Pfeffer, 2002a, , 2002b). The cardiorenal model describes HF as a problem with excessive salt and fluid retention that is caused by renal dysfunctions, manifested by decreased creatinine clearance. Cardiac output in this condition may be normal (Francis, 2006). The cardiocirculatory, or hemodynamic model, illustrates HF as a clinical syndrome of decreased cardiac output that is a consequence of decline in cardiac pumping capacity and excessive peripheral vasoconstriction. The most contemporary view is the neurohormonal model where progression of cardiac dysfunction is a result of the activation of the RAAS, the SNS, and a complex neuroendocrine response that includes a release of natriuretic peptides (Jessup & Brozena, 2003; Mann, 1999). This mechanism emphasizes that the impaired myocardial capacity eventually requires activating the neurohormonal compensatory systems to regulate renal and cardiovascular function to prevent systemic hypoperfusion (Bell, 2003). The activation of the compensatory mechanism involves a vicious cycle of physiological and pathological changes.

The activation of the RAAS and SNS, however, leads to the progressive loss of cardiac myocytes because of accelerated programmed cell death (apoptosis) and necrosis, and further results in myocardial dysfunction. This process is known as ventricular remodeling (Bell, 2003; Mann, 1999). Left ventricular remodeling is the process of structure changes in the left ventricular in order to render a more spherical shape with a dilated and/or hypertrophic chamber (Carelock & Clark, 2001; Hunt et al., 2005). Remodeling occurs following injury of cardiac myocytes and extracellular matrix, and may play as an independent role in the progression of HF. Several factors including automatic, neurohormonal, and genetic are involved in the remodeling process to alter ventricular size, shape, wall stress, and both diastolic and systolic function (Jessup &

Brozena, 2003; Mann, 1999; McMurray & Pfeffer, 2002a). Neurohormonal activation not only results in the ventricular remodeling process, it also causes symptoms such as tachycardia, fatigue, dyspnea or sleep disturbances, resulting in limitations in physical and psychosocial functioning, and diminished HRQOL (Havranek et al., 2003).

Evidence-Based Management of Heart Failure

The AHA/ACC practice guidelines created by an expert panel emphasize that evidence-based management of HF includes control of risk factors, early detection, and therapeutic treatments comprising pharmacologic, non-pharmacologic, and device treatment options (Hunt et al., 2005). The goals for HF management are to reduce morbidity and mortality. The guidelines recommend therapies for each stage of HF as follows: for people in stage A, treatment includes addressing risk factors and using an angiotensin-converting enzyme inhibitor (ACEI) or angiotensin receptor blocker (ARB, when intolerant of ACEI) for vascular disease or diabetes; in stage B, treatment consists of appropriate lifestyle changes, a combination of ACEI or ARB and beta-blockers, implantable cardiac-defibrillator, and coronary revascularization; for stage C, recommendations include lifestyle changes, low salt diet, exercise training, avoiding non-steroidal antiflammatory drugs and antiarrhythmic drugs , a combination therapy of ACEI or ARB, beta-blockers, and spironolactone; and stage D therapy includes fluid restriction, cardiac assist devices, heart transplantation, inotropes, and end-life planning with patients and their families for hospice or palliative treatments (Hunt et al., 2005; Macabasco-O'Connell, Rasmusson, & Fiorini, 2006). The AHA/ACC Guidelines have also been used by healthcare providers in Taiwan to guide care of patients with HF (Chen, Chiang, & Lin, 2005; Hsu, Chang, Pai, Lo, & Ling, 2006).

The expert panel addresses the need to use clinical guidelines to direct, standardize, and simplify care, and finally help translating effective interventions into

practice (Hunt et al., 2005). Research has found that although several pharmacologic and nonpharmacologic therapies have been developed to treat HF, the quality of care in HF is not optimal, particularly in elderly and those with diastolic HF (Hunt et al., 2005; Luthi, McClellan, Flanders, Pitts, & Burnand, 2006; Wu & Yu, 2005). The sheer number of available interventions creates difficulty for clinicians in decision making. Management that focuses on treatment of HF pathology may have a positive effect on HF prognosis, though limited in efforts to prevent early mortality (90 days) (Mehta & Cowie, 2006) and improved HRQOL (Dobre et al., 2006). Several evidence-based interventions, such as ACEI, beta-blockers, and cardiac resynchronization have shown benefits, however, they are underutilized (Luthi et al., 2006; Macabasco-O'Connell et al., 2006).

A continuum of care is needed that incorporates inpatient and outpatient management using a multidisciplinary strategy to maintain or improve patients' daily functioning, prevent frequent hospitalizations, and reduce mortality (Berkowitz, Blank, & Powell, 2005; McAlister, Stewart, Ferrua, & McMurray, 2004). Although the benefits of pharmacologic treatment to HF prognosis have been supported, research has also found that HRQOL in people who received evidence-based medications did not improve significantly (Dobre et al., 2006). The lack of significant effect on HRQOL may be associated with side effects of the medications. The greater number of medications and dose adjustments increases the chance of non-adherence and development of adverse effects (Stewart, Marley, & Horowitz, 1999). Combining non-pharmacologic interventions, such as lifestyle modifications, dietary control, exercise, and rehabilitation, thus, is needed to counteract those adverse effects (Dobre et al., 2006; Wu & Yu, 2005). Adherence problems may follow medication and life modifications if adjustments in daily activity are needed (Havranek et al., 2003). People may adhere to interventions according to their perceptions of the effectiveness of the treatment and the degree that their lives are

affected. Therefore, understanding how their life is affected and factors related to their HRQOL is important to implement effective HF management.

Health-Related Quality of Life in Heart Failure

HRQOL is one of the most important goals of HF management (Hunt et al., 2005). Rhodes and Bowles (2002) contended that assisting patients with HF to promote a positive attitude in daily life during the disease trajectory, especially in early stages, can result in important therapeutic outcomes and better HRQOL. A higher sense of HRQOL is important in maintaining a state of overall well-being that reflects an optimistic perspective (Acton, 1994; Spilker, 1996). In viewing themselves in a positive way, people with HF may have better motivation to adhere to long-term HF management.

The impact on HRQOL caused by HF is greater than the normative population and other chronic illnesses, such as hypertension, recent myocardial infarction, Parkinson disease, and cancer (Bosworth et al., 2004; Juenger et al., 2002; Riedinger, Dracup, & Brecht, 2002). A secondary analysis of the Studies of Left Ventricular Dysfunction baseline data was conducted to compare HRQOL of 691 female HF subjects with that of a normative group and that of women with other chronic conditions (Riedinger et al., 2002). The mean age in this sample was 60.6 years old with a range of 21 to 80. The mean education was 10.86±3.02 years. The mean left ventricular ejection fraction (LVEF) was 27±7%. The majority (61.2%) of subjects had a history of myocardial infarction and NYHA Class II or III HF. Most women suffered from HF symptoms, including dyspnea (69.5%), chest pain (44.6%), and dizziness (44.1%). HRQOL was measured using a HRQOL instrument comprising 90 items drawn from several questionnaires: the Profile of Mood States Inventory, Functional status Questionnaire, the Beta Blocker Heart Attack Trial Instrument, Symptoms Scale, Ladder Life, the RAND Medical Outcomes Study Instrument.

The study (Riedinger et al., 2002) found that women with HF reported poorer physical functioning than did those with hypertension. HF subjects performed basic daily activities, such as bathing, eating, dressing, and moving in and out of bed, better than people with chronic obstructive pulmonary disease (COPD), Parkinson disease, or elderly hospitalized adults, however, they had a more limited ability to perform intermediate daily living tasks, such as grocery shopping, climbing stairs, and walking several blocks. Likewise, HF women participants had significantly worse anxiety and depression scores than did people with hypertension, elderly people, and the normative population. They also had worse anxiety score than those patients with cancer. However, they had better depression scores than did patients with cancer, myocardial infarction after one month, and COPD. Likewise, the social activity in the women with HF was lower than normal. They also had poorer perceived health than did patients with other conditions.

Similar findings were reported in a qualitative study using three different focus groups (each with five male outpatients with HF) by Bosworth et al (2004). Participants' ages ranged from 47 to 82 years, and the majority (79%) were married. The LVEF ranged from 26 to 40%. Ten patients were classified with NYHA Class I/II and five with NYHA Class III/IV. Approximately 38% had a high school education, and 31% had college degree or graduate studies. The authors found that HF participants experienced worse physical, mental, and social functioning, and more severe and unpredictable physical symptoms, such as fatigue, dyspnea, and sleep disturbances, compared to prior studies of people with other chronic diseases. All participants expressed frustration about the loss of ability to carry out usual work or social role and its negative effect on HRQOL. In addition, the unpredictability and uncertainty of HF progression led to anxiety, depression, and fear. Participants also said that they feared being a burden to their family and friends.

Likewise, Juenger and colleagues (2002) compared HRQOL in 205 outpatients

with stable HF and systolic dysfunction with a healthy reference population and with those with other chronic diseases in Germany. The mean age in this sample was 54±11 years with a range of 19 to 74 years. The mean LVEF was 22±10% with a mean onset of HF of 4.7 years. The HF cause for most participants (57.6%) was dilated cardiomyopathy, and 25.4% coronary artery disease. Approximately 47.8% were in NYHA Class II, and 40.4% were in NYHA Class III. HRQOL was measured using the RAND Medical Outcomes Study Short From-36 (SF-36). The authors found that people with HF had poorer HRQOL in eight domains of the SF-36 compared with a healthy reference population. HRQOL decreased significantly as the NYHA Class worsened, and the pattern of decrease was similar to patients on chronic hemodialysis. Furthermore, people with HF had lower scores in physical functioning, role functioning, physical health, and general health compared to patients with chronic hepatitis C infection. HF participants with NYHA Class III presented similar mental health problems to those with major depression in addition to reduced physical functioning. However, LVEF, length of diagnosis of HF, and age did not show any significant relationships with HRQOL. In addition, patients with a more severe impairment of functional capacity reported poorer HRQOL. However, functional indices [six-minute walk test (Guyatt, 1987) and peak oxygen uptake] only explained 51% of the impairment in HRQOL. The authors concluded that other potential determinants of HRQOL should be assessed to provide for better understanding.

HRQOL in Western People With Heart Failure

A variety of research studies have been conducted about HRQOL in Western people who are living with HF. Heo, Moser, Riegel, Hall, and Christman (2005) tested the feasibility of the HRQOL model developed by Wilson and Cleary (1995) showing the dynamic interrelationships of several patient outcomes such as functional status,

symptoms, biophysiological variables (e.g. biomarkers, LVEF and NYHA Classes), psychological variables (e.g. emotional support and relationship with families and friends), and QOL. The study was a secondary analysis of data from 293 hospitalized HF patients with NYHA Class II-IV from two randomized, controlled clinical trials of HF management interventions. The mean age in this sample was 73±11 years, and 53% were females. Participants were classified as the NYHA Class II (18%), III (50%) and IV (29%). Approximately 76% of participants had at least one comorbid condition, such as previous myocardial infarction (53%), diabetes (33%), and COPD (31%).

In this study (Heo et al., 2005), the biophysiological factor was tested using the number of comorbidities, functional status was assessed using NYHA Class, and HRQOL was measured using the Minnesota Living with Heart Failure Questionnaire (MLHFQ) (Rector, Kubo, & Cohn, 1987). Results showed that health perception, symptom status, and age explained 29% and 21% of variance in HRQOL measured by the total MLHFQ and the emotional subscale. Furthermore, health perception, symptom status, and NYHA Class accounted for 28% of variance in HRQOL measured by the physical subscale. Health perception mediated the effect of symptom status on HRQOL. Moreover, NYHA Class did not mediate the relationship between symptom status and health perception. The researchers concluded that subjective variables rather than objective factors were the most consistent and significant components of HRQOL.

The study (Heo et al., 2005), however, used only the NYHA Class to measure functional status which may be insufficient (Juenger et al., 2002). Other researchers have contended that functional status in HRQOL refers to the entire domain of daily functioning including physical, social, and psychological and can be measured by self-reported instruments (Aaronson, 1988; Cooley, 1998; Leidy et al., 1999; Wenger, 1989). NYHA Classes are assessed by physicians and may not truly reflect the effects of

HF on daily functioning. A study by Subramanian (2005) found that 165 outpatients with NYHA Class ranging from I to IV (mean age 63±8.7 years) only had slight agreement between patients and healthcare providers in the assessment of severity of HF. Patients rated their HF at worse levels than did their providers, although provider ratings of NYHA Class was a better predictor of hospitalization.

In this study (Subramanian et al., 2005), most participants (69.7%) were female, and the mean LVEF was 51±15%. Approximately 44.2% of the participants had NYHA Class II HF and 31.4% had NYHA Class III. On average, the participants had 3.63 comorbid conditions, including hypertension (98.7%), coronary artery disease (82.1%), diabetes (75.0%), and COPD (41.7%). The mean Charlson comorbidity score (Deyo, Cherkin, & Ciol, 1992) was 3.74±2.1, indicating a high burden of illness. In addition, participants perceived themselves as being more ill than their healthcare providers did. The authors suggested that further research is needed to understand factors associated with patients' perception of their symptoms and the severity of HF.

Many research studies have found a consistently significant relationship between NYHA Class and HRQOL. In a descriptive, correlational study with 61 outpatients with advanced HF undergoing heart transplantation recruited from two university-affiliated hospitals, researchers found that NYHA Class was an important predictor for both mental and physical HRQOL (Westlake et al., 2002). The mean age in this sample was 56.8±13.8 years and the mean LVEF was 21.8±6.1%. The majority of participants were men (74%), married (72%), and 41.7% were retired. They were classified as in the NYHA Class III (36.6%), Class II (26%), and Class IV (12%). Participants reported a low level of HRQOL measured by the SF-36. NYHA Class, six-minute walk distance, and neuroticism explained 49% of the variance in the mental health component of HRQOL. NYHA Class and time since symptom onset were significant predictors of the physical

health component of HRQOL. Participants with poorer functional status (measured using the NYHA Class and six-minute walk test) perceived their health to be worse.

Similar findings regarding NYHA Class with a low level of HRQOL were reported in 87 HF patients with NYHA Class II to III recruited from three urban and suburban hospitals (De Jong et al., 2005). This study was a substudy of a prospective, randomized clinical trial aimed to determine the optimal disease management strategy. Data were collected at patients' home after one week after their discharge from the hospital. Participants had a mean age of 72±11 years, mean education of 12±2 years, and mean LVEF of 38±15%. Approximately 47% were married, 31% were widowed, and 51% were living alone. In terms of comorbitity, participants reported a history of hypertension (75%), coronary artery disease (70%), myocardial infarction (38%), and coronary artery bypass grafting (34%). HRQOL was measured using the Minnesota Living with Heart Failure Questionnaire (MLHFQ). The findings showed that NYHA Class, higher depression, and higher anxiety were important predictors of HRQOL. However, LVEF, comorbidity, and health perception were not correlated with HRQOL. The study supported the view that both physical and psychosocial functioning are important domains of HRQOL in people with HF. HRQOL in this study, however, was conceptualized as a component of health status. This is different from the notion that many researchers have when they view health status as synonymous with HRQOL (Berzon, 1998; Erickson, 2000; Guyatt et al., 1993; van der Steeg et al., 2004) or a constituent of HRQOL (Albrecht, 1994; Yao, 2000). Because the two studies above were cross-sectional, they did not address whether HRQOL changes over time in people with different NYHA Classes.

Hauptman and colleagues (2004) conducted a descriptive study to examine the changes in HRQOL in 484 people with advanced or non-advanced HF over a six-week

period. Advanced HF was defined as NYHA Class III with a hospitalization within the preceding six months or in NYHA Class IV (n=118). Participants in the advanced HF group had lower LVEF (23±8% vs. 25±8%, p<.01), and elevated jugular vein pressure (36% vs. 10%, p<.001), compared to those in non-advanced group. However, the participants with advanced HF had lower but not significant percentages of medication use (ACEI and beta-blockers). HRQOL was measured using the Kansas City Cardiomyopathy Questionnaire (KCCQ), and perceived health was measured using the visual analog scale of the EQ-5D (also called EuroQOL) (Kind, 1996). The results showed that participants with advanced HF reported significantly worse KCCQ overall summary scores (46±21 vs. 66±22), EQ-5D scores (51±20 vs. 66±19), shorter six-minute walk distance (756±368 feet vs. 1039±371 feet), and higher levels of B-type natriuretic peptide (501±431 pg/ml vs. 359±381 pg/ml) than those with non-advanced HF. Except for the domains of self-efficacy and QOL, greater changes in the remaining KCCQ domains (physical and social limitations, symptom stability, frequency, and severity, clinical summary score, and overall summary score) were found in those with advanced HF at six weeks of follow-up. The authors concluded that NYHA Class is an important variable to document for advanced HF patients to track improvement or further deterioration in status (Hauptman et al., 2004). Though QOL (3 questions in KCCQ) was not significantly worse in advanced HF patients, HRQOL (23 questions in KCCQ) showed greater changes in this group. However, the authors did not further discuss whether greater changes in HRQOL among people with advanced HF were related to the increased use of medication over a six-week period.

Several studies investigated the relationship between HRQOL and individual characteristics. Westlake et al (2002) did not find a significant relationship between HRQOL and demographic data including age, sex, marital status, education, and

employment. Similarly, age, gender, and living alone were not correlated with HRQOL in the De Jong et al (2005) study. However, age, gender, income, and ethnicity were significantly correlated with HRQOL in a descriptive, cross-sectional study by Clark and colleagues (2003) study. They (Clark et al., 2003) found that older participants perceived better health and reported better HRQOL than younger. Likewise, age and gender played important roles in HRQOL in Hou's study (2004) with a 26-week follow-up period.

Clark and colleagues (2003) reported a moderate level of HRQOL in 228 HF patients (32% males and 68% females) who lived in an urban community and were characterized by lower-income, lower-education, and limited resources. The participants had a mean age of 62.9±8.6 years, mean LVEF of 50±16%, varied NYHA Classes (23% I, 51% II, 23%III, and 4% IV), and a mean Charlson comorbidity (Deyo et al., 1992) score of 3.7±2.1. HRQOL was measured using the KCCQ (functional and clinical summary scores) and the three domains (dyspnea, fatigue, and emotion) of the Chronic Heart Failure Questionnaire (CHQ) (Guyatt et al., 1989), and a single item of overall perceived health. Participants with greater age, better satisfaction with income, lower NYHA Classes, positive health beliefs, better social support, better communication with their physician, males, and black respondents reported better HRQOL. Greater age and more positive health beliefs were correlated with overall perceived health. The Charlson comorbidity score had a weak negative correlation with the KCCQ scores. However, perceived health, LVEF and comorbidity were not predictors any of the HRQOL measures. The study highlighted the significance of demographics, socio-cognitive factors, and environmental resources in HRQOL. The comorbidity result, however, was similar to findings reported by Feldman et al. (2004) that showed 371 patients with fewer comorbid conditions had better HRQOL.

In Hou et al (2004) study, HRQOL was measured using the Chronic Heart Failure

Questionnaire (CHQ) (Guyatt et al., 1989) and two domains (physical and emotional) of the Minnesota Living with Heart Failure Questionnaire (MLHFQ) (Rector et al., 1987). Overall, a moderate level of HRQOL was found in 165 outpatients receiving care at two urban county hospitals (86 females and 79 males) with NYHA Classes from I to IV. Most participants (78%) had baseline NYHA Class II or III HF. HRQOL was improved significantly measured by the CHQ total, emotional, and dyspnea scales over a 26-week period. At baseline, people with HF less than 65 years old (n=119) reported poorer HRQOL on scores of the CHQ total scale, the dyspnea, fatigue, and emotional subscales of the CHQ, the MLHFQ total scale, and the emotional subscale than did older people (n=46). Women had poorer HRQOL on scores of the CHQ total scale, the dyspnea and emotional domains of the CHQ, and the emotional domain on the MLHFQ than did older people. At 26 weeks, participants younger than 65 years and women had significantly worse MLHFQ total scores compared to their counterparts. After controlling several factors including race, marital status, living arrangement, perceived income, educational level, baseline NYHA class, mental status scores, and baseline HRQOL, women under 65 years reported significant improvements in CHQ total scores more than men under 65 years and women ≧65 years. They also improved significantly more on the emotional symptoms than did men less than 65 years old and more on the CHQ fatigue scores than did women ≧65 years. However, there were no significant group differences in HRQOL changes measured by the MLHFQ.

The Clark et al (2003) and Hou et al (2004) studies appear to support the view that women under 65 years who experience HF have more difficulties in adjusting lifestyles compared to men and older women, congruent with the findings from Plach, Napholz, and Kelber (2001). Women under 65 years often have multiple roles. Accordingly, they may experience more role impact and uncertainty with cardiac disease.

Decreased energy due to illness may disrupt their ability to perform responsibilities such as childcare, housework and work duties. More research studies regarding the impact of HF on this population, however, are needed.

To compare changes in HRQOL among older and younger HF patients with left ventricular systolic dysfunction, a multicenter prospective study was carried out by Masoudi et al (2004). The study recruited 546 participants at the baseline, 484 of whom finished the 6±2-week follow-up. The mean LVEF for participants age less than (n=328) and greater than 65 years (n=218) were 24±8% and 26±8%, respectively. HRQOL was measured using the KCCQ. The results showed that both older and younger patients had moderate HRQOL and decreased functional capacity. At baseline, although older patients had worse functional capacity measured by the NYHA Class and the six-minute walk distance, they reported better HRQOL than younger patients. However, older patients with a decline in NYHA Class from baseline to follow-up also experienced significant declines in HRQOL compared to younger patients. The authors concluded that elderly patients with HF are at risk for worsening HRQOL with further decline in functional capacity. Maintaining functional status in older adults with HF is important to promote higher level of HRQOL for later life in elderly people with HF (Masoudi et al., 2004).

Several studies provide insights to HRQOL in elderly patients with HF. A secondary data analysis of HRQOL with 138 older adults with HF (69 men and 69 women) was conducted to investigate the differences in HRQOL between older adult men and women with HF (Friedman, 2003). Participants completed two interviews over a four to six-week period. The baseline data were collected face-to-face during the participants' hospitalization for HF, and the second interview was done by telephone four to six-week later with the participants at home. The mean age in this sample was 76.5±6.81 years, mean LVEF was 33.6±13.7%, and mean years since HF diagnosis was

4.4±5.4 years. On average, participants had 2.25 comorbid conditions, including coronary artery disease (71%), hypertension (51%), arrhythmia (40%), and diabetes (45%). The mean number of symptoms reported at time one was 7.2±2.6 and 4.0±2.5 at time two, including dyspnea, fatigue, weakness, edema, and orthopnea. The findings showed that participants' HRQOL was significantly impacted by the decreased daily activities and symptoms (Friedman, 2003). Both older men and women had similar reported HF symptoms, rates of depression, and rehospitalization. Approximately 93% of males and 96% of females reported that they had difficulties performing vigorous activities. Twenty-three percent of the participants were rehospitalized four to six weeks after the initial hospital discharge. However, older women reported more physical dysfunction than older men. Women's physical functioning was significantly decreased at time two.

Similar findings were found in a study of 191 Swedish elderly patients with HF with a mean age of 75.4±5.3 years (102 males and 89 females) (Cline, Willenheimer, Erhardt, Wiklund, & Israelsson, 1999). There were no significant differences in demographic data between men and women, including LVEF (33±11% vs. 36±11%), HF duration (2.5±3.9 vs. 2.2±3.7 years), NYHA Class (2.5±.8 vs. 2.7±.7), HF treatments, and comorbidities. HRQOL was measured by two subscales of the Quality of Life Questionnaire in Severe HF (QLQ-SHF) (Wiklund et al., 1987) and the Nottingham Health Profile (NHP) (Hunt et al., 1980) and Patients' Global Self-Assessment. Compared to men, women had a significantly greater degree of somatic symptoms and a decrease in perceived physical capacity as measured by the QLQ-SHF. They also reported a higher level of disturbance on scores of all the NHP subscales: emotion, sleep, energy, pain, and activity and health-related problems, including housework, social life, home life, sex life, hobbies and interests, as well as the holiday subscale.

In the Cline study (1999), except for gender, HRQOL was different among

participants with different NYHA Classes, marital status, and comorbidities. Researchers found that the higher the NYHA Class, the poorer HRQOL in patients with HF. Single patients had greater levels of social isolation and physical inactivity than did married. Conversely, married patients and those with a history of hypertension felt their health affected their sex life more than their counterparts. Patients with a history of angina reported a more significant impact on HRQOL in regard to emotion, sleep, energy, mobility, housework, and holiday than those without. However, no significant differences in HRQOL were found between patients with LVEF less and greater than 34%, smokers or non-smokers, with or without diabetes, or a history of myocardial infarction.

Researchers, however, have defined HRQOL differently. HRQOL was constructed by concepts of health perception and functional status including activities of daily living and instrumental activities of daily living in a study by Chin, Zhang, and Rathouz (2003). Using the 1991 to 1994 data from the Medicare Current Beneficiary Survey, the authors identified 872 older adult patients with HF (311 males and 561 females) in 1991. At baseline, the mean age in this sample was 79.2±.28 years. Approximately 54% of whom had less than 12 years of education, two-thirds had comorbid conditions, and 58% rated their health as "fair" or "poor." At a one-year follow-up, 18% of the patients had died. A decline in HRQOL was more common in older adults who originally ranked health perception as "excellent" or "very good" health perception. The prior year's HRQOL and cormobidity were important predictors of the subsequent year's HRQOL. Health perception and functional status were strongly correlated with mortality. Subjects who reported poor health perception had higher chances of dying in the next year. Additionally, older women were more likely to have impairments in daily living activities, such as bathing, walking, and getting out of beds or chairs, as well as instrumental activities of daily living, such as doing light or heavy

housework, using the telephone, and shopping for personal items. The authors concluded that older adults with HF have worsening health status over time. Measures of prior health status are useful in predicting subsequent health state.

Similar to others studies reviewed for this research, Arnold, Ranchor, Koeter, de Jongste, and Sanderman (2005) found no direct relationship between LVEF and general health perception measured by the SF-36 general health perception subscale in a descriptive, correlational study with 90 HF outpatients (22 females and 68 males) with LVEF less than 45%, although LVEF was independently related to physical functioning measured by the SF-36 physical functioning subscale. The subjects had a mean age of 59.6±10.0 years, mean LVEF of 30.3%±9.4%, and mean HF duration of 6.5years. Self-reported physical functioning was significantly related to general health perception. Perceived personal health competency was strongly related to patients' perceptions regarding their HRQOL, including symptom, physical functioning, and general health perception.

To study the differences in HRQOL between patients with systolic and diastolic dysfunction, Jaarsma et al (1999) carried out a study with 186 HF patients. The mean age in this sample was 73±9 years (range 50-94) with the NYHA Class III or IV. The mean LVEF in the systolic HF group was 29.2±7.5% (n=150) and in the diastolic dysfunction was 56.4±9.9% (n=36). The findings showed that both groups had similar low HRQOL. Except for ankle edema reported more often by people with diastolic dysfunction, both groups experienced the same amount of symptoms. People in the diastolic dysfunction group were more likely to be elderly and female, and often had a history of hypertension. Although patients with systolic dysfunction had poor psychosocial adjustment to illness, they reported fewer problems with the medical system and treatment, and less ankle edema than those in diastolic group. The study findings, however, were limited by the

study design using an imbalanced sample size (150 vs. 36).

HRQOL in Taiwanese and Chinese People With Heart Failure

Several studies regarding HRQOL have been conducted with Taiwanese and Chinese people with HF. Wang (2005) reported a descriptive, cross-sectional study to investigate QOL and its correlates in Taiwanese people with HF. Eighty outpatients (43 males and 37 females) with NYHA Class I to IV were recruited from a medical center located in Northern Taiwan. The mean age in this sample was 65.75±11.49 years (range 27-96). The majority of the subjects were married (78.8%), unemployed (77.5%), an educational level of elementary school (41.2%) or illiteracy (25.0%), NYHA Class II (38.8%) or Class III or IV (56.2%), and history of hypertension (71.3%) and diabetes (50.0%), as well as a history of HF for six years and less (60%). The findings showed that participants had a moderate level of QOL measured by the five domains of Quality of Life Index (psychosocial, health, environment, intimate, and family factors) (Ferrans & Powers, 1985). Participants rated the psychosocial domain as most important but least satisfied. In contrast, the intimate factor was ranked as the least important, but the most satisfied factor among domains. QOL decreased significantly as NYHA Classes increased. Participants perceived moderate to high emotional support from families and relatives. Moreover, demographic data including age, gender, marital status, employment status, education, and length of diagnosis with HF were not correlated with QOL. The study highlighted the importance of psychosocial QOL in Taiwanese people with HF.

The relationships between HRQOL, psychological factors, and perceived dyspnea were investigated in another descriptive, correlational study with 100 Taiwanese outpatients (54 males and 46 females) with HF (Cheng, 2004). The subjects had a mean age of 60.70 ±10.61 years with NYHA Class I (5%), II (42%), or III (53%). The majority were married (56%), unemployed (85%), living with families (85%), and illiterate (52%).

They had a mean LVEF of 43±19% (range 11-82) and mean HF duration of 3.59±2.23 years (range 1-13). The mean number of medications used was 3.78±1.61, including digoxin (78%), ARB (56%), diuretics (52%), calcium blockers (30%), beta-blockers (17%), and ACEI (16%). The etiology for HF was heart valve disease (64%), ischemic heart disease (55%), hypertensive heart disease (37%), and dilated cardiomyopathy (15%). On average, participants had 1.89 comorbid conditions, including arrhythmia (39%), hypertension (37%), and diabetes (33%). HRQOL was measured by the Medical Outcome Study Short Form-12 (Ware, Kosinski, & Keller, 1996). The results showed that the participants had mild to moderate level of perceived dyspnea, fatigue, and depression. Participants who perceived more dyspnea and fatigue reported a poorer physical health component of HRQOL, whereas patients who had more depression and fatigue experienced a worse mental health component of HRQOL. Depression, however, mediated the effects of dyspnea on both physical and mental health domains of HRQOL. This study indicates the importance of psychological effects on HF symptom management and improvement in HRQOL, similar to findings in the Wang study (2005). These two studies, however, used QOL or generic HRQOL instrument that may be insufficient to measure HRQOL in people with HF, because the non-HF specific tool lacks sensitivity to measure effects of HF and its related symptoms on daily functioning (Bennett et al., 2003).

Psychological distress was the strongest predictor of HRQOL in a study with 227 Hong Kong Chinese people with HF (119 females and 108 males) (Yu et al., 2004). Participants had a mean age of 77.1±7.9 years (range 60-95), mean time for HF diagnosis of 3±2.64 years, and approximately 87.7% had one or more chronic comorbid conditions. Hypertension was the most common condition, affecting 50% of the participants. Most participants in this study were in NYHA Class II (49.8%) and III (33.9%). HRQOL was

measured using the Chronic Heart Failure Questionnaire. The results showed that participants had a moderate level of HRQOL with symptoms of fatigue being worse than those of dyspnea. In addition, more psychological distress, more functional impairment, perceived poor health, and a lower educational level were identified as predictors of poorer HRQOL. Furthermore, variables including age, social support, married status, and living arrangements were significantly related to HRQOL. Conversely, factors, such as gender, income, years of having HF, and number of comorbid conditions were not correlated with HRQOL. The authors (Yu et al., 2004) suggested the need to develop effective interventions to promote psychological and functional health and a positive attitude towards health status to enhance their HRQOL.

In Yu and colleagues (2004) study, participants with higher education were more likely to report better HRQOL. The result is similar to findings in studies by Lam and Lauder (2000) and by Lai et al (2005) of people with chronic illnesses (not HF). Lam and Lauder (2000) studied 760 Chinese participants with a variety of chronic illnesses and found that educational level affected physical fitness scores on HRQOL. Lai et al (2005) found that educational level had a significant effect on all domains of HRQOL measured by the brief version of the World Health Organization Quality of Life Questionnaire in 465 institutionalized Taiwanese elderly people in long-term care settings (The WHOQOL Group, 1998). Authors of these three studies, however, did not further discuss these findings regarding education on HRQOL. Clarifying whether patients with higher education have better resources and abilities to adjust their illnesses and life expectations could be useful. Hershberger et al (2001) found that HRQOL increased when patients' recognition of HF symptoms and knowledge in self-care improved. Rockwell and Riegel (2001) proposed that people with more education might have better critical thinking abilities that enhance their behaviors to take care of themselves and thus, promoting

better HRQOL. Likewise, Shih (2002) found that HF participants with higher levels of education also reported better self-efficacy for daily activity. Perceived self-efficacy, however, is important to improve functional capacity and psychological status for Taiwanese people with HF (Tsay & Chao, 2002).

Using tailored message strategies can be an effective way to avoid redundant educational content and to teach HF knowledge that patients actually need (Bennett, Hays, Embree, & Arnould, 2000). Shang (2002) tested the effectiveness of a coping skill training program that measured the effects of disease recognition, stress management, and self-care strategies on perceived stress, self-care self-efficacy, depression, and HRQOL. Forty hospitalized HF participants were classified into interventional (abbreviated as I, n=20) or control groups (abbreviated as C, n=20). Each group consisted of 11 (55%) females and nine males (45%). The demographic data, including age [66.10±13.78 years (I) vs. 67.45±10.13 years (C)], married status, living arrangement, education [7.45±4.27 (I) vs. 7.10±4.08 (C)], and income did not significantly differ between the two groups. Eleven participants in the interventional group were in NYHA Class II, while 11 in the control group had NYHA Class III. The average number of HF symptoms was 5.55±1.23 (I) vs. 4.8±1.24 (C), and the number of rehospitalization due to HF was 2.00±1.03 (I) vs. 2.40±1.60 (C).

The study (Shang, 2002) showed that participants who received coping skill training did not show better HRQOL than did those in the control group. The findings may indicate that the intervention did not fit patients' needs or reflect the multidimensional and dynamic nature of HRQOL. Researcher attention to patients' opinions of what they need to learn is an important part of engaging in HF care (Hagenhoff, Feutz, Conn, Sagehorn, & Moranville-Hunziker, 1994). Failure to identify factors that are most important could result in the treatment being ineffective and

inapplicable.

Summary of Literature Related to HRQOL in HF

In summary, research studies reviewed for this research showed that HRQOL in people with HF was moderate to low. Among domains of HRQOL, symptoms and functional status had the greatest impact. People with HF encountered significant psychological impact and emotional problems, such as depression, anxiety, and uncertainty, even though they perceived social and emotional support from families and friends. They also reported social limitation, such as maintaining social life and relationships with friends, especially for those with advanced HF.

From the literature, HRQOL was affected by a variety of factors. These factors, however, did not show consistent relationships with HRQOL. Findings from these studies may support the view that HRQOL presents different meanings in varied cultures and populations (Fayers & Machin, 2000).

Individual characteristics and HRQOL. For findings about demographics, HRQOL studies regarding age and gender in people with HF showed that elderly patients and men reported better HRQOL than younger people and women. Married people reported greater impact on their sex life, whereas single adults expressed greater restriction in social interaction and physical activity (Cline et al., 1999). A significant correlation between income and HRQOL was found in one study, however, it was conducted with patients with lower-income and limited resources. More studies are needed to clarify this finding. Furthermore, two variables, educational level and living arrangement, were found to be related to HRQOL among Chinese people, however, the relationship has not been found in studies conducted with Western populations. Finally, employment status, had a low but non-significant association with HRQOL.

For findings regarding health-related characteristics, some studies did not support

the hypothesis that HF patients with fewer comorbidities have better HRQOL. Likewise, perceived poor health was found in several studies and had a significant impact on domains of HRQOL.

HF characteristics and HRQOL. Studies reviewed did not find that people who have been diagnosed with HF for a longer time reported better or worse HRQOL. Although most studies showed that higher NYHA Classes caused greater impairment in HRQOL, researchers argued that this objective functional index only partly explained the impairment of HRQOL (Juenger et al., 2002). Furthermore, research studies did not find any significant relationship between HRQOL and LVEF. This is congruent with the studies showing no significant difference in HRQOL between diastolic and systolic HF. However, the evidence was insufficient. More research studies are needed to understand the influence of diastolic HF on HRQOL.

Sleep Disorders in Heart Failure

Distinguishing the symptoms of HF, such as lethargy, fatigue, cardiopulmonary intolerance, and paroxysmal nocturnal dyspnea, from the symptoms of sleep disturbances is not easy, especially if the symptoms are caused by sleep-related breathing disorders (SRBD) (Kohnlein, Welte, Tan, & Elliott, 2002; Lai et al., 2005). Researchers argue that more studies are needed to support the pathophysiological mechanism of sleep disturbances and HF. However, it has become evident that the sleep disturbances, periodic breathing, apnea-related surges in blood pressure and heart rate, and cardiac ischemia have created a vicious cycle that can hinder the restoration of the damaged myocardium and further increase the threat to patients' lives (Lanfranchi & Somers, 2003; Leung & Bradley, 2001; Rao & Gray, 2005; Spieker & Motzer, 2003).

Pathophysiology of Sleep-Related Breathing Disorders

The pathophysiological effects of HF, however, show that cardiovascular

autonomic regulation can be interrupted by sleep disorders (Leung & Bradley, 2001). Two most common SRBD in HF are obstructive sleep apnea (OSA) and Cheyne-Stokes respiration with central sleep apnea (CSR-CSA). Both OSA and CSA-CSR share several features, and they result in similar adverse effects on HF, although they have different pathophysiology. Both have an adverse effect on a failing myocardium by: increasing the left ventricular filling pressure, activating the sympathetic nervous system, increasing cardiac oxygen demand and decreasing myocardial oxygen supply, and increasing arousals from sleep (Leung & Bradley, 2001; Spieker & Motzer, 2003). Two common features of SRBD, intermitted hypoxia and frequent arousals from sleep, further induce excessive daytime sleepiness, insomnia, difficulty initiating and maintaining sleep, light sleep, and early awakening, resulting in fatigue and a worsening of the cardiopulmonary function (Lanfranchi & Somers, 2003; Spieker & Motzer, 2003). As a result, a vicious pathophysiological cycle can be created whereby SRBD causes more severe HF and much worse SRBD.

Arousal from sleep has been viewed as an important factor in sustaining the cyclic periodic breathing (Kohnlein et al., 2002). Arousal from sleep may activate sympathetic activity, resulting in catecholamine hypersecretion, vasoconstriction, and increased blood pressure (Leung & Bradley, 2001; Parker & Dunbar, 2002). As a result, the chemosensitivity is destabilized, and further triggers hyperventilation, which leads to lower levels of arterial carbon dioxide tension (PaCO2). When the reduction in PaCO2 reaches the “apnea threshold,” apnea in sleep is precipitated (Kohnlein et al., 2002; Yamashiro & Kryger, 1993). The consequent apnea leads to an increase in PaCO2 and a decrease in arterial oxygen tension (PaO2) with consequent hyperpnea, which lowers PaCO2 and continues the breathing cycle (Yamashiro & Kryger, 1993).

Left ventricular failure with the characteristics of high filling pressure, low

cardiac output, and inadequate myocardium perfusion can be worsened by the sympathetic activity and catecholamine release, and fluctuations of PaO2 and PaCO2 (Leung & Bradley, 2001). Consequently, pulmonary edema can be precipitated which further triggers stimulation of pulmonary juxtapulmonary capillary receptors (J-receptors), initiating rapid and shallow breathing, hypotension, and bradycardia (McCance & Huether, 2006). Moreover, individuals may suffer from hypersomnolence and fatigue because of sleep disruption (Kohnlein et al., 2002; Leung & Bradley, 2001).

A model illustrating the pathophysiology of SRBD is shown in Figure 2. Here key physiological relationships are identified. Pathophysiological mechanisms can potentially be used as a guide to further test effects of sleep disorders in people with HF. Both HF and sleep disorders can interact with each other and independently interrupt patients' daily lives.

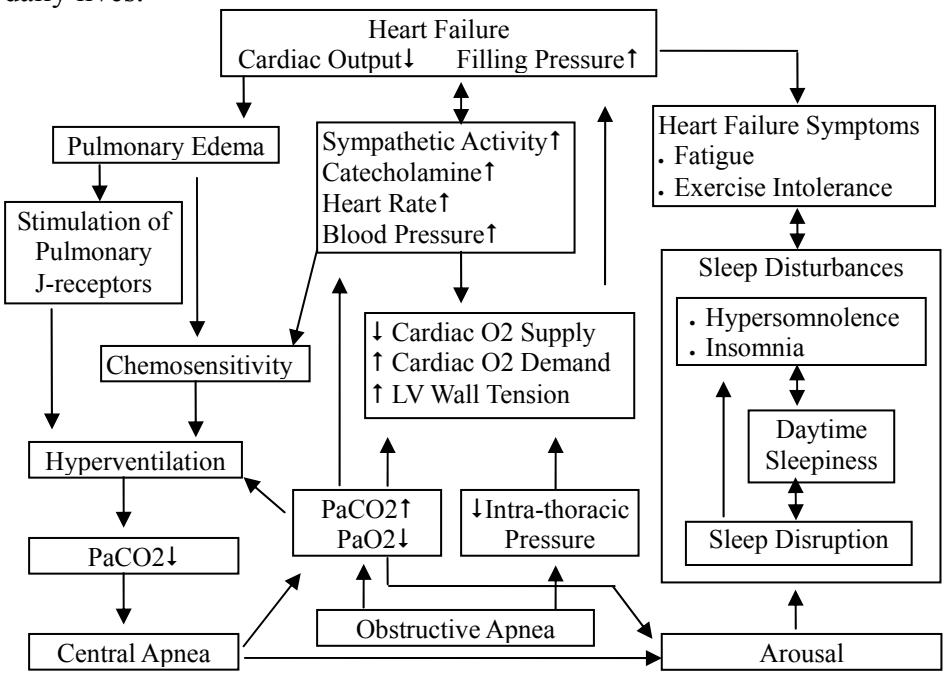

Figure 2. Pathophysiological Concepts in Heart Failure and Sleep Disorders [Modified from Leung and Bradley (2001) and Kohnlein, Welte, Tan, and Elliott (2002)].

Research Studies Related to the Pathophysiology of SRBD in Heart Failure

Many studies regarding sleep disorders in HF focused on the effects of SRBD. Several studies have assessed the prevalence of SRBD in people with HF. Thirty-eight outpatients with HF were recruited to participate in a screening for SRBD at a heart clinic (Trupp et al., 2004). All participants were under age 65 years with a mean body mass index of 32.4kg/m^2. Approximately 62% were male and 59% were in the NYHA Class III. The screening was done by asking participants to undergo an overnight study, and data included thoracic impedance, oxyhemoglobin saturation, and 2-lead electrocardiogram. SRBD was defined by using the respiratory disturbance index (RDI). The results showed that four participants (10%) had severe SRBD (RDI >15/hour), 12 patients (32%) had moderate SRBD (RDI= 5-15/hour), and 22 patients (55%) had mild or no significant SRBD (RDI <5/hour). Researchers did not classify the SRBD as obstructive or central sleep apnea.

Generally, patients with HF and SRBD who have an apnea-hypopnea index (AHI) of more than 20 events per hour experience more sleepiness and fatigue than those with an AHI of less than 20 (Morrell, 2003). A significant difference, however, was not found in Jahaveri et al. (1995) in their study of forty-two HF patients with a LVEF less than 45%. The results showed that 19 (mean age 63±10 years) participants had moderate to severe SRBD, and more than 50% of the apnea-hypopnea episodes were identified as central apnea. Participants with an AHI of over 20 events per hour had significantly higher arousal index (24±12 vs. 3±3 episodes), greater duration for oxyhemoglobin saturation (SaO2) drops less than 90% (61±63 vs. 7±13 minutes), greater severity of SaO2 drops (74±13% vs. 87±4%), increased number of episodes of nocturnal ventricular arrhythmias, and lower LVEF (22±9% vs. 30±10%) compared to those with an AHI of 20 events or less per hour (n=23, mean age 63±10 years). However, arterial blood gases,

loud snoring, and sleep architecture values such as total sleep time, sleep onset, and sleep stages did not differ significantly between patients with an AHI of 20 or less and those with an AHI over 20. Furthermore, age was not correlated with SRBD. Body mass index was positively correlated with OSA, but not central apnea. LVEF was a significant predictor of the AHI. The lower the LVEF, the greater was the AHI in patients with moderate to severe SRBD. In addition, the central apnea index was a significant determinant of ventricular arrhythmias.

A sample of 301 HF patients (262 males) with a LVEF less than 40% was used to test the association between daytime systolic blood pressure and the presence of OSA in a cross-sectional study (Rostagno et al., 2003). Those with an AHI greater than 10 events per hour during sleep were recognized as SRBD. The findings showed that 105 (35%) patients with HF had OSA (mean age 59.4±1.1 years) and 121 (40%) had CSA (mean age 67.2±0.9 years). People with OSA had significantly higher daytime systolic blood pressure and body mass index (32.7±.2 vs. 26.1±.4 vs. 28.4±.1) and a history of snoring (79.1% vs. 41.1% vs. 49.2%), but they had significantly lower mean SaO2 during sleep (92.5±3.2% vs. 93.3±1.9% vs. 93.5±2.6%) than those patients with CSA and non-SRBD (n=75, mean age 56.9±16 years, LVEF 26.0±1.7%). Additionally, subjects with OSA had significantly higher diastolic blood pressure than those with non-SRBD. On the other hand, patients with CSA had a significantly lower LVEF (23.6±1.5% vs. 30.4±1.5%) and PaCO2 (38.2±6.8 mmHg vs. 44.7±6.7 mmHg) but a higher AHI than (40.3±2.0/hour vs. 34.1±1.9/hour) did patients with OSA. After controlling for age, gender, LVEF, SaO2, and body mass index, the study showed that people with OSA were 2.89 times more likely to experience systolic blood pressure greater than 140 mmHg than those without OSA. A single blood pressure measurement, however, might be insufficient for representing the participants' general blood pressure status. Furthermore, longitudinal

studies are needed to ascertain the causal relationship of OSA and high diastolic blood pressure.

OSA and CSR-CSA may coexist in patients with HF (American Academy of Sleep Medicine, 1999). In a retrospective study, 22 men with OSA and HF, as well as 18 men with OSA alone, were recruited for a comparison of the duration of the apnea-hyperpnea cycle (Ryan & Bradley, 2005). Those two groups were matched for age, body mass index, total sleep time, arousals, sleep-stage distribution, minimum SaO2, and mean transcutaneous PCO2. The mean LVEF for patients with HF and OSA was 26.8%. The diagnosis of OSA was based on an AHI of at least 10 events per hour during sleep, as obtained from previous overnight PSG data. The results showed that, compared to patients with OSA alone, patients with both HF and OSA had a significantly longer periodic breathing cycle, hyperpnea duration with more breaths, and lung-to-chemoreceptor circulation time. Furthermore, lung-to-chemoreceptor circulation time was significantly correlated with hyperpnea duration, breaths per hyperpnea, and time to peak tidal volume (TV), but it was not correlated with apnea duration. Following an apnea event, patients with OSA exhibited an abrupt rise and rapid decline in TV, whereas patients with HF and OSA presented a gradual rise and slow decline in TV. The study results supported the argument that, in people with HF and OSA, the increased circulatory delay may influence the physiological manifestations of OSA, for instance, by prolonging hyperpnea and shaping a CSR-like pattern. Furthermore, the study may also support the view that CSR-CSA becomes much more prevalent when the LVEF is below 35% (Pepin, Chouri-Pontarollo, Tamisier, & Levy, 2006).

Research Studies Related to the Patient's Perspective About Sleep Disorders

Only a few studies have investigated the relationship of sleep disorders in HF from the patient's perspective. Researchers have investigated sleep disorders and their

effects on the physical and psychosocial health of patients with HF. Several studies have addressed the prevalence of sleep complaints. In the EuroHeart survey of 187 patients with HF (99 males), over 40% of the participants reported dyspnea during sleep and 23% were re-hospitalized within 12 weeks after being discharged from the hospital (Lainscak & Keber, 2003). The mean age in this sample was 70.6±11.4 years. Participants were classified as NYHA Class I (33%), II (45%), and III (18%). The prescribed HF medications included ACEI (70%), Furosemide (74%), digoxin (48%), and beta-blockers (27%). The findings showed that one-third of the participants woke up during the night due to dyspnea in the week prior to the interview. Over 60% of the participants experienced sleep disturbances, including an inability to get to sleep (63%), waking up and having difficulty getting back to sleep (69%), and lacking sufficient refreshing sleep (60%). They also suffered from several psychological symptoms including anxiety (70%), depression (50%), stress (48%), and cognitive impairment (53%).

Similar findings were found in another survey study, one with 84 HF patients (59 males and 25 females) with a mean LVEF of 21.7±6.3% (Erickson et al., 2003). The mean age for this sample was 54.1±10.8 years, and mean NYHA Class was 2.8±.8. Approximately 44.6% of the subjects had HF of ischemic etiology and 39% had obesity. Sleep complaints were measured using the 16-item Modified Sleep Disorder Questionnaire by the authors. Approximately 56% of the participants reported trouble sleeping. The most common symptoms were inability to sleep flat (51%), restless sleep (44%), trouble falling asleep (40%) and awakening early (39%).

In the Erickson and colleagues (2003) study, sleep disorder symptoms were further tested, and correlations were found with demographics, clinical variables, and HF severity. The findings showed that increased age was associated with “not tired at bedtime” and “awaken with heart pain.” Male HF patients experienced more trouble

returning to sleep, but less daytime sleepiness. Although sleep disorders were not correlated with LVEF and peak oxygen uptake, daytime sleepiness was positively associated with NYHA Functional Classification and negatively related to the six-minute walk test (Guyatt, 1987). In addition, a higher NYHA Class was associated with several symptoms, including breathing cessation during sleep, restless legs, and waking before necessary. The researchers did not, however, provide correlation coefficients in the article, and information about the strength of associations between sleep disturbances and the independent variables is still limited (Erickson et al., 2003).

Brostrom and colleagues (2001) conducted a qualitative study in which 20 HF patients were interviewed to explore sleep disorders. Age ranged from 38 to 82 years for the male participants (n=13) and 55 to 85 years for females (n=7). Thirteen were married and five were widows/widowers. The etiology for HF was ischemic heart disease (n=10), hypertension (n=4), cardiomyopathy (n=4), and heart valve disease (n=2). Twelve of 20 were in NYHA Class II HF, five in Class III, and three in Class IV. The findings showed that the participants' sleep was influenced by their daily activities, such as gardening and accidents; aspects of the HF itself, such as deterioration and side effects of medications; and cardiac symptoms, such as dyspnea, dysrhythmia, and cough. Sleep disturbances caused several adverse effects, including fatigue, listlessness, and loss of temper, and they also resulted in a need for daytime sleep, seclusion, counseling, and information. The participants dealt with sleep disturbances by adjusting their daily activities and looking for support from families and friends.

The finding that HF participants reported poor sleep and thus demanded more daytime sleep in Brostrom and colleagues (2001) study is similar to findings in other studies conducted with general and elderly populations. Daytime sleepiness was common in people who were elderly; had nocturnal sleep disturbances, such as frequent

awakenings, difficulty in falling asleep again after nocturnal awakening and nonrestorative sleep, and loud snoring; and somatic diseases, such as, diabetes and cardiac diseases (Asplund, 1996; Ohayon et al., 1997; Whitney et al., 1998). However, daytime sleepiness occurred particularly in HF patients who habitually used sleeping medications and complained about nocturnal polyuria (Asplund, 2005).

Summary of Literature Related to Sleep Disturbances and Heart Failure

In summary, up to 70% of people with HF have been found to experience some type of sleep disorder. Although the pathophysiological mechanism between sleep disorders and HF is still not completely understood, it is clear that sleep disorders can cause negative effects on the progression of HF, resulting in a vicious cycle. Meanwhile, sleep disorders are associated with both physical and psychosocial health dangers. Several factors, such as age, gender, body mass index, HF symptoms, and SRBD have been linked to sleep related symptoms. Research focusing on the pathophysiology of SRBD tended to investigate physiological changes in HF. In contrast, studies concerning the patient's perspective about sleep disorders were more likely to measure sleep symptoms and their impact on daily functioning. Study findings from literature, however, have suggested that identifying people's sleep problems is important to HF management. Generally, people with more severe HF experienced poor sleep quality. The most common sleep disorders in HF are SRBD and insomnia. Daytime sleepiness may follow both SRBD and insomnia.

The Relationship Between HRQOL and Sleep Disorders

Most research studies have not presented consistent findings for the association of severity of HF and sleep disorders (Jahaveri et al., 1995; Principe-Rodriguez et al., 2005) nor sleep apnea and sympathetic activation (Mansfield et al., 2003; Solin et al., 2003). However, researchers did find consistent results in the effects of sleep disorders on

HRQOL in people with HF (Brostrom et al., 2004; Lainscak & Keber, 2003; Rao et al., 2006; Redeker & Hilkert, 2005; Skobel et al., 2005; Villa et al., 2003).

The effects of SRBD on HRQOL were investigated in 51 HF patients with LVEF less than 35% and NYHA Classes II (n=40, as 17 for SRBD and 23 for non-SRBD) to III (n=11, as 9 for SRBD and 2 for non-SRBD) (Skobel et al., 2005). All participants (36 males and 15 females) presented with exercise intolerance and exertional dyspnea, but only patients with HF and SRBD had reduced peak oxygen uptake. An AHI of five events per hour was used to identify SRBD. Twenty-six (52%) participants with a mean age of 61±11 years were diagnosed with SRBD: 12 for CSR, 5 for OSA, and 9 for mixed sleep apnea. The mean LVEF was 23±7% for the SRBD group and 26±6% for the non-SRBD group (n=19, mean age 52±10 years).

Depression symptoms, HRQOL, and sleep quality were compared with those of 10 age-matched healthy adults and 11 patients with OSA. Sleep quality was measured using the 19-item Pittsburgh Sleep Quality Index (Buysse et al., 1989), which showed that 37% of the patients with HF and SRBD were poor sleepers (Skobel et al., 2005). Patients with both HF and SRBD had poorer sleep quality, greater depression symptoms, and less total HRQOL compared to healthy adults and HF patients without SRBD. Three dimensions of HRQOL—physical health, bodily pain, and emotional functioning—had the greatest impact. Sleep quality, depression symptoms, and HRQOL were not significantly different among HF patients with different types of SRBD. Interestingly, the latter three variables in patients with both HF and SRBD were similar to those with OSA without HF. The findings suggested that SRBD adversely affected HRQOL, disturbed sleep itself, and resulted in depression symptoms in patients with HF. Improving SRBD is, therefore, important to improving HF status, sleep and HRQOL.

In a study of 14 outpatients with severe HF (mean LVEF<30%) who were waiting

for heart transplantation, three (21%) were diagnosed with CSA , using the criterion of an AHI greater than 10 per hour (Villa et al., 2003). Patients with CSA reported less HRQOL and poorer tolerance to exercise than those without CSA. Furthermore, age (49.9 vs. 57.6 years), LVEF (26.3±7.09% vs. 27.18±12.18%), NYHA Class (3 vs. 2.45±.6), pulmonary function tests (33% vs. 50%), body mass index (29.4±.8 vs. 28.4±5.3), snoring (33% vs. 50%), hypersomnolence (34.8 vs. 43.5), and witnessed apneas (33% vs. 14.3%) were not significantly different between patients with and without CSA. Those findings, however, need confirmation by other studies, because the sample size in this study was small.

Treatments of SRBD, including supplementary oxygen, medications, and continuous positive airway pressure (CPAP), have been widely used in clinical practice (Morrell, 2003; Naughton, 2005). In a randomized trial, Mansfield et al. (2004) examined the effects of CPAP on systolic heart function, sympathetic activity, BP, and HRQOL in patients with HF and OSA. One hundred and fifty-six patients with LVEF less than 45% and NYHA of Class II to IV were invited to undergo a polysomnography. An AHI greater than five obstructive events per hour was used to diagnose OSA. The results showed that 69 (44%) patients met the criteria of OSA, and 55 were randomly assigned to either CPAP (n=28) or control (n=27) groups. The mean age for CPAP was 57±1.6 years, and for the control group was 57.2±1.7 years. Only three females enrolled in this study and all of them were in the CPAP group. There were no significant differences in baseline characteristics between the control group and CPAP group: mean LVEF (33.7±2.4% vs. 37.1±2.3%), body mass index (34.6±1.2 kg/m^2 vs. 33.5±.9 kg/m^2), NYHA Class (2.4±.2 vs. 2.5±.2), AHI (28.1±3.9 events/hour vs. 28.3±.4 events/hour), arousal index (30.4±4.3 events/hour vs. 42.2±8.9 events/hour), Epworth Sleepiness Scale (9.2±.9 vs. 10.7±.7), minimum overnight pulse oxygen saturation (SpO2) (77.3±3.2% vs. 79.3±2.2%), urinary norepinephrine (21.8±1.8 nmol/mmol creatinine vs. 20.6±3.1 nmol/mmol creatinine), and

mean blood pressure (107±3 mmHg vs. 99±3 mmHg). However, peak oxygen uptake had a significant difference between the two groups (16.4±2.3 ml/kg/min vs. 20.3±1.2 ml/kg/min). Forty out of the 55 participants finished a three-month follow-up. Compared with the control group of 21 patients, 19 patients in the 3-month overnight nasal CPAP treatment group had significant improvements in LVEF, overnight urinary norepinephrine, AHI, SpO2, daytime sleepiness, and HRQOL; however, mean blood pressure, peak oxygen uptake, NYHA Class, and body mass index did not significantly change after the CPAP treatment.

Redeker and Hilkert (2005) examined the extent to which sleep quality, duration, and continuity were relative to functional performance and mental health among 61 patients (39 males and 22 females) with stable systolic HF (LVEF less than 35%). The participants had a mean age of 59.5±12.85 years (range 28-83), mean body mass index of 30.39±6.40, and mean LVEF of 22.9±8%. Most participants were in the NYHA Class II (n=34) and III (n=21). Comorbid conditions in this sample included cardiomyopathy (71%), hypertension (59%), dysrhythmias (34%), diabetes (39%), and coronary artery bypass (41%). The study was conducted using a descriptive, cross-sectional design. Each participant wore a wrist actigraphy to record nocturnal sleep duration, continuity, and daily activities for three days while living at home. Sleep quality was measured using the PSQI and HRQOL including physical and mental functioning was evaluated by the SF-36.

Results showed that there were no statistically significant relationships with age, gender, comorbidity, and sleep variables (Redeker & Hilkert, 2005). However, participants with a higher NYHA Class reported poor sleep quality (r=.40, p<.001). Approximately 34% of the patients used sleeping medication at least occasionally. There were small to moderate negative correlations between PSQI and physical functioning

(r=-.40, p<.001), six-minute walk distance(r=-.42, p<.05), and mental functioning (r=-.34, p<.01). Time in bed was negatively correlated with physical functioning (r=-.31, p<.05) and daytime activity (r=-.31, p<.05). Longer sleep latency was related to poor physical functioning (r=-.27, p<.05). After controlling for age, gender, comorbidity, and NYHA Class, self-reported sleep quality and actigraph-recorded wake time and wake bout time accounted for 9% to 20% of the variance in the functional performance variables (daytime activity level, 6MWT, SF-36 physical functioning) and mental health. There were no statistically significant relationships between sleep duration and functional performance. The study suggested that sleep quality and continuity are more important than quantity. Perceived sleep quality may be most relevant to mental health, whereas objective data for sleep continuity may be most relevant to functional performance. The authors also suggested the need to examine the effects of sleep problems and insomnia in HF patients with non-SRBD (Redeker & Hilkert, 2005).

In Redeker and Hilkert (2005) study, the finding that sleep duration was not associated with functional performance is different from other researchers' view that sleep duration is a risk factor that affects health and daily functioning (Dement, 2005; Lauderdale et al., 2006). Sleep duration has effects on improving neurocognitive performance and eliminating fatigue during daytime and sleep debt (Dement, 2005). More research is needed to clarify this area.

A cross-sectional study was conducted to test the effects of sleep difficulties and daytime sleepiness on the HRQOL of 223 patients with HF (Brostrom et al., 2004). Approximately one-third of the HF participants felt they did not get enough sleep, and another third reported they slept too much. Difficulties in maintaining and initiating sleep were the most often reported sleep complaints. The highest frequency of nocturnal awakening was 10. Furthermore, 25% of the participants were awake one to three hours

per night. Approximately 90% of the 133 men (mean age: 75±9 years) and 80% of the 90 women (mean age: 78±9 years) experienced nocturia. About 50% felt sleepiness and fatigue during daytime and habitually took a nap during the day. Estimated sleep needs were greater for males than for females. Additionally, patients suffering difficulties in maintaining and initiating sleep, early morning awakenings, and excessive daytime sleepiness reported significantly lower HRQOL compared with patients without sleep difficulties. The three dimensions of HRQOL most influenced by sleep disturbances were general health, vitality, and social functioning (Brostrom et al., 2004).

Excessive daytime sleepiness, HRQOL, and neurohumoral markers were assessed in a study with 84 HF outpatients who underwent an overnight recording of respiratory impedance, SaO2, and heart rate using a home-based, wireless monitor (Rao et al., 2006). SRBD was identified by using an AHI greater than 15 events/ hour. Results showed that the prevalence of SRBD was 24% in all participants, 15% in participants (n=53) with LVEF greater than 35%, and 38.7% in those (n=31) with LVEF less than 35%. The participants with SRBD had a significantly higher level of B-type natriuretic peptide and urinary noradrenaline levels than those without SRBD. However, the B-type natriuretic peptide was much higher than the normal range for all participants, indicating that patients with HF had a high level of neurohumoral activation. The more severe HF, the higher B-type natriuretic peptide. The authors suggested that the increased sympathetic nervous activation in HF was related to HF rather than the SRBD. Likewise, in comparison with a normal reference group (Walter, Munro, & Brazier, 2001), all domains of HRQOL showed significant impairments for all HF participants except for mental health. There were no significant differences in HRQOL and excessive daytime sleepiness between HF patients with and without SRBD. The study indicated that SRBD occurred in patients with mild to moderate HF. Furthermore, a disease-specific instrument

may be more appropriate in measuring HRQOL for this particular population.

Based on the finding that patients with SRBD did not rate themselves as excessively sleepy, Rao and colleagues (2006) suggested the need to further clarify whether HF patients take napping to prevent sleepiness in the daytime, particularly for elderly patients. However, daytime napping was significantly associated with greater sleep efficiency, longer sleep duration, and better global sleep quality in the Lai (2005) study of 60 Taiwanese community-dwelling older adults. In this study, the majority (64%) of participants reported habitual napping 20 to 60 minutes in the daytime, especially after lunch. This finding (Lai, 2005), however, was different from the Ohayon et al (1997) study that found increased daytime napping was strongly associated with moderate to severe daytime sleepiness in the British population. Lai (2005), however, did not measure daytime sleepiness in the study. Concerning ethnic differences in physiology and the fact that after-lunch napping is prevalent among Taiwanese people, further studies are needed to clarify the relationship between sleep quality, daytime napping, and daytime sleepiness.

Summary of the Relationship Between HRQOL and Sleep Disorders

Sleep disorders have been found to negatively affect HRQOL. Although comparison studies did not show consistent findings in HRQOL between HF populations with SRBD and non-SRBD, many studies found that functional capacity and psychological functioning were the two domains of HRQOL most affected by sleep disorders. Likewise, sleep disorders can cause several negative consequences in daily activities.

Summary and Conclusion

The literature reviewed for this chapter has supported the need for investigating HRQOL in Taiwanese people with HF. An overview of HF, its pathophysiology and

evidence-based management were described. A review of the research literature about HRQOL, sleep disorders, and their relationship were presented. Sleep disorders in HF may be an area that has been overlooked by healthcare providers. Sleep disorders can create a vicious cycle of HF pathophysiological changes. The need to understand the relationship between sleep disorders and HRQOL in Taiwanese people with HF is imperative. This understanding will be necessary to design and test future assessments and interventions to relieve suffering related to sleep disorders and HRQOL in this population.

Chapter 3: Methods

This chapter describes the methods that were employed to conduct this study. It includes a discussion about research design, population and sample, procedures for data collection, instruments, data analysis methods, and the protection of human subjects. The findings from a pilot study to translate one of the key instruments are described.

Research Design

A cross-sectional, descriptive correlational design was used to determine the relationships between individual characteristics, HF characteristics, sleep disorders and HRQOL. A cross-sectional design is applied to measure an existing phenomenon at a given point in time for the purpose of inferring trends over time (Polit & Beck, 2004; Trochim, 2001). Cross-sectional data can be used to infer time sequence under two conditions: when there is evidence for logical reasoning indicating that one variable preceded the other, and when a strong theoretical framework guides the analysis (Polit & Beck, 2004). Correlational research also is well-known as *ex post facto* study (Polit & Beck, 2004). The descriptive correlational study design is based on a conceptual perspective to describe a phenomenon that naturally occurs in the present and is considered to have causes that can be found in the past. Accordingly, this design looks for cause-and-effect relationships in the result but without indicating the direction of the relationships at the beginning of the study (Brink & Woo, 2001). Also, the study results cannot infer a cause-and-effect relationship because of the lack of control over the independent variables (Polit & Beck, 2004). Correlational research is strong in reflecting real phenomena and useful to provide evidence to resolve practical problems (Polit & Beck, 2004).

The cross-sectional, descriptive correlational design is appropriate for this research study based on several factors: (1) HRQOL is an existing phenomenon in people

with HF, and it can be changed over the course of HF. Understanding current HRQOL is helpful to predict HRQOL in later life; (2) although the concept of HRQOL in HF is not fully understood, previous studies have shown that several variables are believed to be related, such as sleep disorders and severity of HF; (3) variables in this research including, sleep quality, individual characteristics, and HF characteristics, cannot be manipulated in reality and ethically; and (4) ex post facto is efficient and effective to collect a large sample in a short period of time (Brink & Woo, 2001; Polit & Beck, 2004).

Population and Sample

The target population of this study was people with HF living in Taiwan. The sample was recruited from a large medical center and its affiliated hospital located in southern Taiwan. A non-probability sampling method was employed to recruit participants. Taiwanese HF patients who were treated at the outpatient departments for HF at either of these two hospitals were invited to participate in this study. Inclusion criteria were as follows: (1) a diagnosis of HF with any Class of NYHA I, II, III, or IV (The Criteria Committee of the AHA, 1994) as determined by physicians, (2) age 18 or older, (3) community-dwelling, (4) able to communicate either by speaking Mandarin or Taiwanese or writing Mandarin (the official Chinese language), and (5) willing to participate in this study. Data were collected for approximately four months from October 2006 to January 2007. The first 125 participants who met the criteria were enrolled to take part in the formal data collection.

The sample size was calculated using the software Power Analysis and Sample Size (PASS) 2005 based on Cohen's (1988) statistical power analysis method. The effect size was estimated using the Spearman rank correlation coefficients (s_r) for the associations between sleep variables and HRQOL from the pilot study (n=13) for this research. The findings showed that the Kansas City Cardiomyopthy Questionnaire

(KCCQ) demonstrated the following associations: Self-Rated Health Status (SRHS) (s_r=.85, p<.001); Epworth Sleepiness Scale (ESS) (s_r=-.60, p<.05); and with the Pittsburg Sleep Quality Index (PSQI) (s_r=.26, p>.05). In order to obtain a statistically significant association between the sleep variables and HRQOL, a small effect size (.26) was used. Finally, using correlation analysis with a level of power of 0.8 at a significant alpha level of .05, a sample size of 125 was recommended.

Procedures for Data Collection

The study included two parts: a pilot study and the formal data collection. Prior to the formal data collection, a pilot study was conducted to translate the KCCQ from English into Chinese, to assess cultural equivalence of the KCCQ between two languages (English and Mandarin), and to test the psychometric properties of all questionnaires. Procedures and findings from the pilot study are described at the end of this chapter.

In the formal data collection phase, 125 participants receiving care at the outpatient departments for HF at the two hospitals were recruited and invited to complete the questionnaires. All participants were referred by a senior cardiologist though some participants were seen by other cardiologists at the same hospitals. Before data collection, the physician and his research assistants in the hospitals who helped with recruitment were given a flyer that described the purpose and subject inclusion and exclusion criteria. The principal investigator discussed participant recruitment and asked for help in informing patients about the study. The senior cardiologist who was blind to the KCCQ scores reported by the participants rated all participants' NYHA Classes and noted each participant's functional class in the medical record. After receiving potential participants' names, types of HF, and NYHA Classes from the physician or research assistants, the principal investigator contacted the potential participants individually. A cover letter with the principal investigator's contact information was given to each potential participant.

Meanwhile, an oral explanation about the study was done for all participants who verbally agreed to participate in the study. Only two potential participants refused to enroll the study during the recruitment. The principal investigator individually interviewed 120 participants in a private location in the clinic sites, and 3 at their homes. Only two participants could not complete the questionnaires while in the hospital, and were given the questionnaires and a stamped pre-addressed envelope and asked to complete and return them within 10 days. The principal investigator was available to assist them as needed and a cell phone contact number was provided. The completion time for the instruments ranged from 20-60 minutes. Data including concomitant health problems, prescribed HF medications, types of HF, NYHA Classes, and LVEF were collected from the hospital medical records after receiving participants' permissions.

Instrumentation

Seven instruments were used for this research study after authors' permissions were obtained. They included: (1) a demographic questionnaire comprising individual characteristics and HF characteristics; (2) the Charlson Comorbidity Index (CCI) and a chart-review list of 10 major concomitant health problems for measuring comorbidities; (3) the modified Self-Rated Health Subscale (Lawton et al., 1982) for measuring perceived health; (4) the Kansas City Cardiomyopathy Questionnaire (KCCQ) (Green et al., 2000) for measuring HRQOL; and (5) two questionnaires about sleep disturbance: the Pittsburgh Sleep Quality Index (PSQI) (Buysse et al., 1989) and Epworth Sleepiness Scale (ESS) (Johns, 1991). They are described in the following section. A summary of the study variables and instruments is shown in Table 1.

Demographic Questionnaire

Individual characteristics. The demographic questionnaire was developed by the principal investigator. Demographic data, including age, gender, education, marital status,

living arrangement, financial status, employment status, and type of language, and health-related characteristics, including body mass index and comorbidity, were obtained from participants.

Table 1
Study Variables and Instruments

Variables	Components	Instruments	Subscales	Items
Demographics	Age	Demographic		8
	Gender	Questionnaire		
	Education			
	Marital Status			
	Living Arrangement			
	Financial Status			
	Employed Status			
	Language			
Health-related	Body Mass Index	Demographic		1
	Comorbidity	Self-report CCI		16
		Chart-review list		10
	Perceived Health	SHRS	Entire subscale	4[a]
Heart Failure	Prescribed HF medications	Demographic		5
Characteristics	Time since diagnosis of HF	Questionnaire		
	Types of HF			
	NYHA Classes			
	Ejection Fraction			
Sleep	Nocturnal Sleep Quality	PSQI	Subjective sleep quality	1
Disorders			Sleep duration	1*
			Sleep latency	2
			Habitual sleep efficiency	3*
			Sleep disturbances	9
			Use of sleeping medication	1
			Daily dysfunction	2
			Snoring	6
			Total	24*
	Daytime Sleepiness	ESS	Entire index	8
	Daytime nap	Additional items		3
HRQOL	Physical Symptoms	KCCQ	Symptom frequency, severity, and stability	4+3+1= 8
	Functional Status		Physical limitations	6
	Psychological Functioning		Quality of life	3
	Social Functioning		Social limitation	4
	Self-Efficacy#		Self-Efficacy	2
			Total	23
Total items for this study				102

*One item overlaps (habitual sleep efficiency subsumes sleep duration).
Not included in the conceptual framework.
[a] Excluded 2 items from the data analysis (using the 2-item modified SHRS for the inferential statistics)

Charlson Comorbidity Index. The Charlson Comorbidity Index (CCI) was originally developed by Charlson, Pompei, Ales, and MacKenzie (1987) as an approach of quantifying preexisting comorbidities using medical record data. The CCI lists 19 comorbidities and is calculated using assigned weights for each condition (zero, 1, 3, or 6). The total weighted score reflects both the number and the seriousness of the comorbidities. The CCI has been validated as a predictor of 10-year mortality in a cohort study of 685 inpatients with breast cancer (Charlson et al., 1987). It also has been widely adapted for use as risk adjustment and predictor of mortality, length of stay, and resource utilization in administrative datasets, such as, patients with ischemic heart disease (D'Hoore, Bouckaert, & Tilquin, 1996) and with coronary artery bypass graft surgery (Wen et al., 2006).

A self-reported version of the CCI was developed by Katz et al (1996). The 16-item self-reported CCI has been validated using a sample of 170 inpatients age greater than 55 years. Respondents were asked to evaluate their comorbid conditions on a 2 -point scale (yes/no). The self-reported CCI score was significantly higher than the medical record-based CCI. Intra-class coefficient and Spearman coefficient for test-retest reliability at an interval of 7 to 8 months for the self-reported CCI was 0.91 and .73, respectively (n=26). Spearman correlation between the self-report method and the medical record-based Charlson index (Charlson et al., 1987) was 0.63. The self-reported CCI has been used in American people with HF (Rockwell & Riegel, 2001). However, the study did not report reliability and validity of the CCI. It was translated by the principal investigator for this study.

Cronbach's alpha for this sample was .28 that was calculated using those conditions reported by the participants. The low internal consistency reliability might result from several comorbid conditions that were reported by few participants only, such

as, cancer (n=1) and hemodialysis (n=3). Likewise, several conditions were not reported by any participants and thus, were removed from the calculation of internal consistency reliability.

In addition to the CCI, a chart-review list of 10 concomitant health problems adapted from the American College of Cardiology/American Heart Association Task Force on Clinical Data Standards (Radford et al., 2005) also was used to assess comorbidity. The list contained more specific cardiovascular diseases that could complement the CCI. The data were collected from the hospital medical records by the principal investigator.

Heart failure characteristics. HF characteristics included prescribed HF medications, type of HF, time since the HF diagnosis, NYHA Class, and LVEF. Time since the diagnosis of HF was obtained from the participants; types of HF, NYHA Class, and LVEF were collected from participants' medical records. Because 29 (23.2%) participants with HF who enrolled in this study did not have LVEF data in their medical records, LVEF was excluded from the analysis of the data.

Modified Self-Rated Health Subscale. The modified 2-item Self-Rated Health Subscale (SRHS) was used to measure perceived health. The SRHS was a subscale of the Philadelphia Geriatric Center Multilevel Assessment Instrument (MAI) (Lawton et al., 1982). The MAI was developed to systematically evaluate behavioral competence in the domains of health, activities of daily living, cognition, time use, and social interaction and in the dimensions of psychological wellbeing and perceived environmental quality among older adults. The SRHS was used to measure the domain of physical health status. Respondents were asked to evaluate their own health on a 3- to 4-point scale based on the designs of the questions. The total score for these 4 items ranges from 4 to 13 with higher score indicating better health perception. Cronbach's alpha for internal consistency

reliability was .76 in a sample of 590 Western older adults who were independent community residents, public housing tenants, in-home services cases, or persons awaiting admission to an institution. The reproducibility reliability for 22 elderly in an interval of 3 weeks was .92 (Lawton et al., 1982).

Validity was assessed using several approaches (Lawton et al., 1982). Multiple correlation coefficient (R) and summary rating correlation between the SRHS and the physical health domain for internal validity in the 590 participants was .47 and .67, respectively. Correlation between independent (community residents plus public housing tenants) and dependent (in-home plus waiting list) groups for discriminant validity was .32. Finally, correlation coefficients between the SRHS and the physical health domain for the content validity rated by the 47 clinicians and 180 housing administrators were .63 and .52, respectively (Lawton et al., 1982).

Related research studies reported moderate to high internal consistency reliability of the SHRS. Lusk, Ronis, and Kerr (1995) calculated the reliability of the SHRS using the theta coefficient, which is a weighted coefficient of Cronbach's alpha and is appropriate for scales with few items or when the scale is anticipated to be multidimensional (Armor, 1973-4). The theta was .76 in 504 blue-collar workers. In another study, Kerr, Lusk, & Ronis (2002) reported a moderate reliability with a Cronbach's alpha of .56 and a theta of .59 in 119 Mexican American workers.

Literature on the use of the SRHS in people with HF has not been found. However, the SRHS has been translated into Chinese-Mandarin by Cheng (2006) for measuring postpartum perceived health status among Chinese immigrant mothers. The Cronbach's alpha of the SRHS in a pilot study with 30 mothers was .66 and the two-week test-retest correlation was .75. The SRHS was negatively correlated with the number of postpartum health conditions and number of days of not feeling mentally well of mothers in the

postpartum period (Pearson *r*=-.36 and -.45, respectively). Overall, the reliability and validity were satisfactory in Cheng's study. Based on the fact that perceived health in people with HF can change dramatically during one year, the time period of "3 years ago" in the item "*Is your health now* (1) *better*, (2) *about the same*, or (3) *not as good as it was 3 years ago?*" was modified to "one year ago" in this present study. Permission for the modification has been received from the copyright holder of the SRHS, Ms. Rachel R. Rensnick.

Cronbach's alpha for the 4-item SRHS in this study with 125 HF participants was .44. Correlated item-total correlation for each item was: .40 (perceived overall health), .29 (health compared to one year ago), .15 (health problems limiting ability to do things they wanted), and .20 (compared with most people's health at the same age). Due to the low Chronbach's alpha of the SHRS, the two items with low corrected item-total correlation were excluded from the inferential analyses of the data. Cronbach's alpha for this modified 2-item SRHS was .55, and corrected item-total correlation was .39 for each.

Kansas City Cardiomyopathy Questionnaire

The KCCQ was developed by Spertus and colleagues (Green et al., 2000). Dr. Spertus has served as a KCCQ consultant on the present study. The KCCQ is a 23-item self-reporting questionnaire designed to quantify several HF-specific domains of HRQOL: physical limitations (6 items); symptoms, including frequency (4 items) and severity (3 items); symptom stability (1 item); self-efficacy (2 items); social limitation (4 items); and quality of life (QOL, 3 items) (Green et al., 2000). Two summary scores have been developed to enhance the interpretability of the KCCQ. A clinical summary score is generated by combining scores for physical limitations and symptom domains. An overall summary score is computed by totaling the scores of the clinical summary score, QOL and social limitation domains (Green et al., 2000). Two domains, symptom stability and

self-efficacy, are not included in the computation of KCCQ overall score because they are not direct measures of HRQOL (Spertus, 2003). Patients are asked to answer questions on how HF has affected their lives over the previous two weeks. Items are scored using an ordinal response scale ranging from 1 to 7. To facilitate comparisons among domains and with other HRQOL questionnaires, such as the Medical Outcome Study Short Form-36 (MOS SF-36) (Ware & Sherbourne, 1992), the KCCQ is scored according to the RAND (Research and Development) criteria, with each domain being transformed to a 0–100 scale. A higher score indicates better health status. The average completion time for the KCCQ is approximately 4 to 6 minutes (Green et al., 2000).

In the psychometric testing study with 70 patients with stable HF, Cronbach's alpha of internal consistency for the KCCQ was physical limitation 0.90, symptoms 0.88, self-efficacy 0.62, social limitation 0.86, quality of life 0.78, clinical summary 0.93, and overall summary 0.95 (Green et al., 2000). Paired t-tests of reproducibility in 39 patients with HF remained stable over three months of observations. Except for symptom stability and self-efficacy domains, criterion-related validity was supported using the SF-36, the Minnesota Living with Heart Failure questionnaire (MLHFQ) (Rector et al., 1987), six-minute walk test (6MWT) (Guyatt, 1987), and NYHA Classifications for remaining domains of the KCCQ in 129 patients (s_r =-0.45 to 0.84, p<0.001 for all).

For discriminant validity, the end point of survival or hospitalization was used to test the predictive ability of the KCCQ using independent t-test. The baseline KCCQ clinical summary (35.1 vs. 55.3) and overall summary scores (34.1 vs. 52.1) were significantly higher among participants with event-free survival than participants who died or who were hospitalized (Green et al., 2000). In addition, stable HF patients had significantly higher mean scores in domains of symptom stability and self-efficacy compared to patients who were hospitalized (Green et al., 2000). ANOVA tests showed

that mean scores on subscales of symptoms, clinical summary, and overall summary were significantly different among patients with different NYHA Classes (Green et al., 2000). Furthermore, responsiveness to change was evaluated using paired t-tests and responsiveness statistic (Deyo, Diehr, & Patrick, 1991). All domains of the KCCQ demonstrated important positive clinical changes ranging from 15.4 to 40.4 points (all $p<.001$, except for social limitation, with $p=.004$). Responsiveness statistic ranged from 0.62 to 3.19 (Green et al., 2000).

The KCCQ has been translated into several languages and its psychometric properties have been tested for patients with either HF or myocardial infarction (Miani et al., 2003; Pettersen, Reikvam, Rollag, & Stavem, 2005; Soto et al., 2004), LVEF greater and less than 40% (Clark et al., 2003; Pettersen et al., 2005), and different ages, gender, diseases, and countries (Masoudi et al., 2004; Miani et al., 2003; Pettersen et al., 2005). Furthermore, studies supported the view that the KCCQ is an indicator of disease severity and predictive of deaths, hospitalizations, and depressive symptoms (Miani et al., 2003; Rumsfeld et al., 2003; Soto et al., 2004; Spertus, Green, Porter, & Bresnahan, 2000).

Two translated versions of KCCQ supported similar evidence of validity of the English version of KCCQ (Miani et al., 2003; Pettersen et al., 2005). All domains of the Italian version of the KCCQ were significantly correlated with the MLHFQ ($s_r= .20$-$.60$) except symptom stability and the MLHFQ emotional component ($s_r=.16$) in 50 Italian patients with HF (Miani et al., 2003). Except for the domains of physical limitation, symptom stability and self-efficacy, the remaining domains of KCCQ were significantly different between NYHA Class I-II and III. Participants with NYHA Class I-II reported higher KCCQ scores than those with Class III. However, no significant difference was found between the levels of LVEF higher or lower than 30% (Miani et al., 2003). Furthermore, except for the domains of symptom stability and self-efficacy, the

remaining domains of the Norwegian version of KCCQ discriminated between patients with and without medication for HF, and among three levels of left ventricular ejection fraction (LVEF, lower than 40%, 40-50%, and greater than 50%) in 408 patients with previous MI (Pettersen et al., 2005). Furthermore, Cronbach's alphas were from 0.66 (self-efficacy) to 0.95 (overall summary score) in a sample of 408 patients with previous myocardial infarction (MI) (Pettersen et al., 2005).

In a cross-sectional study, the clinical summary and overall summary scores of KCCQ demonstrated moderate correlations with the Chronic Heart Failure Questionnaire (Guyatt et al., 1989) three domains (dyspnea, fatigue, and emotional function, r=0.52 to 0.68), and low with NYHA Classification (r=-0.20 to -0.33), comorbidity (r=-0.16), and a single item of perceived overall health (r=0.28 to 0.37) among 228 HF patients with a mean EF of 50% (Clark et al., 2003). However, clinical summary and overall summary scores were not correlated with LVEF.

The KCCQ was translated into Mandarin for this study. Knowledge about cultural equivalence between the original and translated versions was used to guide the translation (Flaherty et al., 1988; Herdman, Fox-Rushby, & Badia, 1998). The procedures for translating and validating the KCCQ are described in the pilot study section. Although the domain of self-efficacy was not included in the conceptual framework of this proposed study, it was used to help interpret the KCCQ domains and overall scores (Spertus, 2003). Cronbach's alpha for each domain was: physical limitations .89 (correlated item-total correlation .60 to .81); symptoms .75 (correlated item-total correlation .34 to .66); self-efficacy .50 (correlated item-total correlation .34); quality of life .67 (correlated item-total correlation .48 to .51); social limitation .75 (correlated item-total correlation .16 [intimate relationship] to .72 [go out for visiting friends]); clinical summary score .87 (correlated item-total correlation .35 to .77); and overall summary

score .90 (correlated item-total correlation .13 [intimate relationship] to .77 [doing yardwork, housework, or carrying groceries).

Pittsburgh Sleep Quality Index

The Pittsburgh Sleep Quality Index (PSQI) was developed by Buysse and colleagues (1989). The PSQI is comprised 19 self-report items (including one question asking participants whether they have a bed partner or roommate) and five questions rated by the participants' bed partner or roommate. These six questions are not calculated in the scoring of the PSQI and used for clinical information only. The remaining 18 items are used to assess sleep quality and disturbances and grouped into seven components: subjective sleep quality (1item), sleep latency (2 items), sleep duration (1 item), habitual sleep efficiency (3 items), sleep disturbances (9 items), use of sleeping medication (1 item), and daytime dysfunction (2 items) over 1-month period. Subjective sleep quality refers to how people rate their overall sleep quality. Sleep latency is defined as the time the individual usually takes to fall asleep. Sleep duration refers to the length of an actual night's sleep. Sleep efficiency indicates the ratio of sleep duration divided by time in bed. Sleep disturbances refers to difficulties in initiating and maintaining sleep. Items ask about causes including nocturia, bad dreams, pain, having troubles in breathing, cough or snore loud, and feelings of extreme cold or warmth. Use of sleep medication refers to how often the people have taken medicine to help sleep. Daytime dysfunction is defined as having trouble staying awake while driving, eating or engaging in social activity.

The PSQI uses a standardized approach to score the patient's sleep quality. Each component of the PSQI is weighted equally with a possible scale range of 0-3. The seven component scores are then summed to produce a global score ranging from zero to 21. A higher score indicates a poor sleep quality. The index takes respondents five to 10 minutes to complete. Reliability and validity of the PSQI was supported during the

testing phase in 148 adults, in four subgroups: healthy controls (n=52), depressives (n=34), disorder of initiating and maintaining sleep (n=45), and disorders of excessive somnolence (n=17). Cronbach's alpha for internal consistency was .83 and stability reliability was .85 (Buysse et al., 1989). Discriminant validity was evidenced with significant differences between the four groups after controlling age and gender. Concurrent validity was partially supported by the polysomnographic findings (Buysse et al., 1989). A global PSQI score greater than 5 yielded a sensitivity of 89.6% and a specificity of 86.5% as a cutoff point for identifying poor sleepers.

Several research studies using the PSQI to measure sleep quality in Western patients with HF did not report psychometric properties of the PSQI (Redeker & Hilkert, 2005; Sinha et al., 2004; Skobel et al., 2005). The PSQI has been used in varied groups, such as postpartum women, menopausal women, patients with end-stage renal failure, older adults, and people with insomnia (Huang, Carter, & Guo, 2004; Lai, 2005; Lu et al., 2005; Tsai et al., 2005; Tsai, Chi, Lee, & Chou, 2004; Tsay, Rong, & Lin, 2003), although the PSQI has not been used in Taiwanese patients with HF.

The psychometric properties of the Chinese version of the PSQI (CPSQI) were evaluated in 208 Taiwanese adults (Tsai et al., 2005). Among them, 51 adults were insomniacs identified by using the Diagnosis and Statistical Manual of Mental Disorders (American Psychiatric Association, 1994). Cronbach's alpha for internal consistency reliability was 0.83 for all 208 adults and 0.72 for 51 primary insomniacs. Pearson correlation coefficient for the test-retest reliability was 0.85 for all participants and 0.77 for 51 primary insomniacs at an interval of two to three weeks. Discriminant validity of the CPSQI was evidenced using two-sample method. The CPSQI score was significantly different between the insomnia (n=51) and control groups (n=157). In primary insomniacs, the CPSQI global score had a significant low correlation with the Sleep

Quality Visual Analogue Scale (r=-.30), which was used to measure an individual's subjective feeling of overall sleep quality with a range of 0-10 (Tsai et al., 2005). Additionally, the CPSQI was significantly correlated with sleep onset latency (r=.30) and sleep efficiency (r=-.37) derived from the 7-day Daily Sleep Log. However, one domain of the CPSQI, daytime sleep dysfunction, was not significantly related to the Stanford Sleepiness Scale (Hoddes, Zarcone, Smythe, Phillips, & Dement, 1973) and the Chinese Epworth Sleepiness Scale (CESS) (Chen et al., 2002). Although the CPSQI demonstrated a 98% sensitivity in distinguishing poor from good sleepers using a cutoff point of 5, the specificity was only 55% which indicated the CPSQI may not be an effective screening tool for discriminating people with primary insomnia from healthy controls (Tsai et al., 2005).

Several studies reported acceptable internal consistency reliability for the CPSQI. In the Lai (2005) study, the overall Cronbach's was 0.74 and the split half reliability was 0.79 for the CPSQI in 60 community-dwelling, elderly people with insomnia. Likewise, the alpha for 98 patients with end-stage renal disease and sleep disturbance was .82 (Tsay et al., 2003). In the Hsu and Lin (2005) study, Cronbach's alpha was .78 in a pilot test, and .74 in the final study of 197 menopausal women. However, two studies reported moderate level of alphas. Cronbach's alpha was .63 in a study with 80 institutional elderly people (Tsai et al., 2004). Likewise, in Huang and colleagues (2004) study, the Cronbach's alpha for 163 first time postpartum mothers was .53. In addition, the authors found that the subjects had large variances in component means, which might be an effect of the population variance on reliability (Huang et al., 2004). Therefore, they suggested that using components of the CPSQI to interpret sleep quality for healthy people may be more applicable than using the global score only.

In the present study, the alphas for both the global and components of the CPSQI

are reported. Cronbach's alpha for domains of PSQI was: sleep latency .78 (correlated item-total correlation .64); sleep disturbances .51 (correlated item-total correlation from .12 to .30); daytime dysfunction .79 (correlated item-total correlation .67); and global PSQI .70 (correlated item-total correlation from .08 [coughed or snored loudly] to .61 [subjective sleep quality]).

Epworth Sleepiness Scale

The Epworth Sleepiness Scale (ESS) was developed by Murray Johns in 1991 to evaluate the general level of daytime sleepiness in adults (Johns, 1991). The self-reporting ESS consists of 8 items that ask respondents to rate the chances that they would fall asleep or doze off in 8 specific life situations, such as, sitting and reading, watching TV, or sitting stopped in traffic. Each of the 8 items is rated in a 4-point Likert scale from 0 (would be never doze) to 3 (high chance of dozing). The total score ranges from 0 to 24 with a lower score indicating low sleep propensity. An ESS score less than 8 reflect that the participants are physically not very influenced by their daytime sleepiness. However, an ESS greater than 10 is defined as excess daytime sleepiness, and 16 and above indicates a high level of daytime sleepiness (Johns, 1991).

Validity for the ESS has been assessed in 150 adults with and 30 without sleep disorders (Johns, 1991). The finding showed that the ESS scores significantly distinguished adults with sleep disorders from those healthy controls. Furthermore, the ESS was significantly correlated with the multiple sleep latency test (MSLT) and overnight polysomnography in the total of 180 respondents (Johns, 1991). Cronbach's alpha for internal consistency reliability was .88 in 150 adults with various sleep disorders and .73 in 104 healthy medical students (Johns, 1992). Pearson correlation coefficient for reproducibility in a 5-month interval for 87 healthy students was .82. Factor analysis for construct validity revealed that the ESS had only one factor in both

patient and healthy student groups (Johns, 1992). Johns (1991) concluded that an individual can provide a meaningful self-report daytime sleepiness from their own perspective.

The ESS has been used in Western people with HF. Brostrom, Stromberg, Dahlstrom, & Fridlund (2004) used a cutoff point of 10 to identify HF patients with excessive daytime sleepiness. The Cronbach's alpha was .71 in a study of 223 participants with HF. However, other HF studies did not provide information about psychometrics of the ESS (Brostrom et al., 2005; Rao et al., 2006).

The ESS has been translated into Chinese-Mandarin (CESS) and used to evaluate daytime sleepiness among people in Taiwan (Chen et al., 2002). To ensure the success of translation, the authors invited 31 bilingual patients with sleep-disordered breathing (SDB) to assess the discrepancy between the ESS and CESS. Participants answered the ESS first and then the CESS at 1-2 weeks intervals. The result showed that no significant difference was found between two versions. Next, the CESS was validated using 359 people with SDB (Chen et al., 2002). Cronbach's alpha for internal consistency reliability in this sample was .81. Test-retest reliability using Spearman correlation coefficient was .74 for 30 of the 359 patients at an interval of 2-4 weeks. Validity was evidenced using a two-sample method and the relationship with PSG. The CESS scores for all 359 participants were significantly higher compared to 31 seemingly healthy controls who were matched for gender, age, and body mass index. The CESS presented a significant low correlation (r_s=.22, n=251) with the Respiratory Disturbance Index (RDI), which was a parameter of the PSG and a measure of the severity of SDB. In addition, the CESS was sensitive to detect clinically important changes at 3 months after radio-frequency palate surgery in 94 people who had initial control of their symptoms (Chen et al., 2002).

Overall, not many research studies reported the psychometric properties of the

CESS. Most researchers merely cited Chen and colleagues (2002) reliability results for their studies (Li, 2004; Li, Chen, Shu, & Wang, 2004; Li, Wang, Hsu, Chen, & Fang, 2005). Huang and colleagues (2004) reported a Cronbach's alpha of .73 for the study with 163 first time postpartum mothers. In another study, the alpha was .86 for 80 institutionalized elderly people (Tsai et al., 2004). In addition, the CESS has been used as a screening tool for identifying people with excessive daytime sleepiness. Lai and Good (2006) used the CESS to select participants for a music intervention. Older community-dwelling people who scored greater than 16 on the ESS were identified as with severe daytime sleepiness and excluded from their study because of their severe daytime sleepiness. For the ESS, Cronbach's alpha for the present study was .74. Correlated item-total correlation ranged from .29 to .61.

The summary of internal consistency reliability for the instruments in this study is shown in Table 2.

Table 2
Summary of Internal Consistency Reliability for Instruments (n=125)

Instruments/ Subscales	Items	Cronbach's α
Modified Self-Rated Health Subscale	2	.55
Charlson Comorbidity Index	19	.28
Kansas City Cardiomyopathy Questionnaire		
Physical limitation	6	.89
Symptom stability	1	NA
Symptom total	7	.75
Self-efficacy	2	.50
Quality of life	3	.67
Social limitation	4	.75
Overall summary score	20	.90
Chinese Pittsburgh Sleep Quality Index	18	.70
Subjective sleep quality	1	NA
Sleep duration	1	NA
Sleep latency	2	.78
Habitual sleep efficiency	3*	NA
Sleep disturbances	9	.51
Use of sleeping medication	1	NA
Daytime dysfunction	2	.79
Chinese Epworth Sleepiness Scale	8	.74

*Nominal variables

Data Analysis

Data collected for this study were analyzed using the Statistical Package for the Social Science (SPSS for Windows, Release 14.0). Before data analysis, data were checked for entry errors, missing values, distributions, normality, homogeneity of variance, homoscedasticity, and linearity for each statistic procedure. The normality of main variables was examined using the kurtosis, skewness, and Kolmogorov-Smirnov analyses (Munro, 2001; Norusis, 2004). The results showed that the normality of the variables was acceptable, except for the variable of time since diagnosed with HF (kurtosis statistic greater than 2.0). Data analysis approaches included (1) descriptive statistics (means, standard deviations, frequency, percentage, range, and mode) for individual characteristics [demographics (age, gender, education, marital status, living arrangement, financial status, employed status, and type of language) and health-related characteristics (body mass index, comorbidity, and perceived health)], HF characteristics (prescribed HF medications, length of time since the diagnosis of HF, type of HF, and NYHA Classification), and major variables; (2) Cronbach's alphas for internal consistency reliability of the KCCQ, CPSQI, CESS, modified SRHS, and CCI; (3) independent t-tests and one-way ANOVA methods for comparing differences between groups, such as gender and NYHA Classification; (4) Bivariate correlations for testing relationships between variables; and (5) hierarchical multiple regression analyses for identifying significant predictors of HRQOL. The level of significance was set at 0.05 for all statistical analyses.

Research questions of this study were analyzed as follows.

Research Question 1. "What sleep disorders are reported by Taiwanese people living with HF?" To answer this question, descriptive statistics (means, standard deviations, and ranges) were used to describe the seven components of nocturnal sleep

quality (subjective sleep quality, sleep duration, sleep latency, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daily dysfunction), daytime sleepiness, and daytime napping. Frequencies and proportions were employed to describe the prevalence of poor sleep quality (PSQI score>5), excessive daytime sleepiness (ESS score>10), and daytime napping.

Research Question 2. What is the perception of HRQOL and health among Taiwanese people living with HF? Descriptive statistics including means, standard deviations, and ranges were used to describe perceived health and the four domains of HRQOL, including physical symptoms, functional status, psychological status, and social functioning.

Research Question 3. What are the relationships between HRQOL, sleep disorders, HF characteristics (prescribed HF medications, duration of HF diagnosis, types of HF, New York Heart Association Functional Classification, and left ventricular ejection fraction), and individual characteristics (age, gender, education, living arrangement, marital status, financial status, employment status, type of language, body mass index, comorbidity, and perceived health)? Bivariate correlations or one-way ANOVAs were used to test the relationships between these variables.

Research Question 4. What are the predictors of HRQOL among Taiwanese people with HF? Multiple regression analyses were used to determine how much variance in the HRQOL could be explained by these independent variables. Before employing the hierarchical multiple regression analysis, the data were examined to ensure that they meet the assumptions of multiple regression analysis. The assumptions included: (1) the dependent and independent variables should be distributed normally. The normality of the Studentized residual (takes into account the differences in variability from point to point) was examined using analyses of a stem-and-leaf plot and a histogram in addition to a Q-Q

plot; (2) all of the observations are independent, meaning that one observation is not correlated with other observation. Independence was assessed using the Durbin-Watson test with SPSS software (normal range from 1.5 to 2.5) (Norusis, 2004); (3) the relationship between the dependent and the independent variables is linear, as well as each group of the independent variables. Linearity assumption was evaluated by plotting Studentized residuals against the KCCQ overall summary score; and (4) for every independent variable, the distribution of the dependent variable has the same variance, which in turn is homoscedasticity. Homoscedasticity was examined by plotting the Studentized residuals against the predicted values. Moreover, multicollinearity were assessed for all variables that were entered into the regression model by using correlation coefficients (less than .80), tolerances (equal or greater than .2), and variance inflation factors (VIF, less than 5) (Hutcheson & Sofroniou, 1999).

Hierarchical regression, one of strategies of multiple regression, is useful to test the effect of key independent variables after controlling extraneous variables that cannot be changed, such as age and gender, and those that are thought of as causally or temporally prior to others. During analysis, the independent variables are entered into the equation in steps. Researchers determine the numbers of steps and variables included in each step, and control the order of variable entry based on logical or theoretical rationale. The variables can be entered one at a time or in subsets. When variables are added as a block, the analysis is a simultaneous regression for those variables at that step (Huck, 2004; Munro, 2001; Polit & Beck, 2004).

For this study, Pearson correlation was initially performed to identify variables that had significant associations with the dependent variable, KCCQ overall summary score. Two variables, type of language and CCI-severity, were eliminated from the hierarchal multiple regression analysis because of the concern for multicollinearity.

Language was moderately correlated with education (r=.68, p<.001), and CCI-severity was highly associated with CCI-number (r=.95, p<.001). A total of 3 covariates and 11 predictor variables were entered to the regression model. Based on the insights from the literature review and the theoretical aspects, individual characteristics (age, education, and financial status) were first entered into the model, then NYHA Classification, CCI-number, chart-review non-cardiovascular concomitant problems, and modified SRHS, and finally sleep variables (daytime sleepiness and all components of nocturnal sleep quality except for the use of sleeping medication).

A summary of statistical methods is shown in Table 3.

Table 3
Summary of Statistical Methods

Research Questions	Purpose	Statistics
	Individual and HF characteristics	Descriptive statistics
Question 1	To describe the self reports of nocturnal sleep quality, daytime sleepiness, and daytime napping	Descriptive statistics
Question 2	To describe the individuals' subjective evaluation of HRQOL and health	Descriptive statistics
Question 3	To answer the relationship between variables	Bivariate correlations and One-way ANOVAs
Question 4	To investigate the predictors of HRQOL	Hierarchical multiple regressions
	Psychometrics: Internal consistency	Cronbach's alphas

Protection of Human Subjects

Approval to conduct this study was obtained from the School of Nursing Departmental Review Committee and the Institutional Review Board (IRB) of the University of Texas at Austin. In addition, approval from the IRB of the facilities in Taiwan was obtained. A cover letter rather than a signed consent form was used to obtain informed consent. This decision was based on the pilot study which showed that

participants wanted to give verbal consent but were unable to or reluctant to sign a written consent form.

Respect for the participants and their confidentiality guided the study. The principal investigator has been trained in procedures to respect the rights of human subjects and to protect privacy and confidentiality of the participants. Participants who agreed to take part in this study received the cover letter that described the purpose of the study, procedures for data collection, potential benefits and risks, time for completing the questionnaires, and ways to contact the researcher. All information provided by participants was treated with confidentiality. Names and identifying data from participants, whether on the transcripts from the focus group discussions or on the questionnaires, were removed and the data were coded numerically. Findings are presented as group data only to eliminate the possibility that information can be linked to individual participants. Questionnaires and the codebook were kept in a locked file cabinet in a safe place. The audiotapes were played by the investigator only for research purposes, and they were erased after they were transcribed. Any identifying information will be destroyed after the study is published.

No discomfort or physical or emotional harm was anticipated for the participants in this study. They were informed that they were free to stop or postpone the completion of questionnaires if they experience temporary discomfort, such as dyspnea or fatigue. To minimize the participants' potential psychological stress, the researcher informed them that not participating in the study would not affect their health care in any way. There were no direct benefits to the participants, however, they may gain some increased awareness about the effects of HF and sleep disturbances on HRQOL.

Pilot Study

A pilot study was conducted prior to the main dissertation study and findings are

reported in this section. The purposes of this pilot study were to: (1) translate the Kansas City Cardiomyopathy Questionnaire (KCCQ) from English to Chinese-Mandarin and to test its usefulness and applicability in measuring HRQOL in Taiwanese patients with heart failure (HF); (2) test the psychometric properties of the KCCQ and three additional questionnaires—the Chinese versions of the Self-Rated Health Sub-index (SRHS), Pittsburgh Sleep Quality Index (PSQI), and Epworth Sleepiness Scale (ESS) in this population; and (3) examine for potential flaws in the procedures for data collection in preparation for the larger study.

Sample in the Pilot Study

A convenience sample was used. Participants were referred by a physician from the outpatient department of a large medical center in southern Taiwan. Participants were recruited for this pilot study according to the following criteria: 1) a diagnosis of HF, 2) age 18 or older, and 3) proven base-line competency in speaking or writing Mandarin or speaking Taiwanese. Participants with any previous diagnosis of mental disorders were excluded. All participants received both an oral and written explanation of the study purpose and procedures by the principal investigator. They were informed that their current treatments would not be interrupted regardless of whether they participated or not. Six participants completed the cognitive interview, four did the focus group discussion, and 13 were in the psychometric testing part (see Table 4). However, most all participants refused to sign an informed consent after verbally agreeing to take part in this study. Some expressed that they were illiterate. In those cases, a copy of the informed consent agreement with the principal investigator's signature was given to them. Only five participants in the baseline measure and two in the re-test accepted the reimbursement of $NTD300 (approximately USD 9.5).

Table 4
Summary of Procedures and Participants for the Pilot Study

Procedures	Detailed Tasks	Number of Participants
Cognitive interview	Assess the understandability, readability, and clarity of the Chinese version of the KCCQ	6
Focus group interview	Discuss item and semantic equivalence between the original and translated versions	4
Psychometric testing- Baseline	Assess the psychometrics of the KCCQ, SRHS, PSQI, and ESS, and two additional questionnaires: Demographics and the SF-36	13
Re-test	For retest: the KCCQ, SRHS, PSQI, and ESS	8

Procedures and Findings of the Pilot Study

The pilot study was conducted in two phases. Phase one was a measurement study used to translate the KCCQ and test for cultural equivalence between the KCCQ, which originated in America, and the responses of Taiwanese people with HF. Procedures for validating the KCCQ included: (a) group discussions for conceptual and item equivalences by a team of experts; (b) translation and back-translation of the KCCQ for semantic equivalence; and (c) interviews, cognitive and focus groups for item and semantic equivalences. Phase two involved psychometric testing for operational and measurement equivalences of the KCCQ and the additional three questionnaires. A re-test of all questionnaires was performed with eight participants two weeks later. The measurement study was conducted between July 2005 and March 2006, and the psychometric testing was performed in April 2006.

Phase One

Group discussions by a team of experts. Two experts in cardiology, familiar with both American and Taiwanese cultures, were invited to discuss the conceptual equivalence of the KCCQ (Flaherty et al., 1988). One expert was a senior cardiologist, and the other a nursing professor. They were asked to examine the conceptualization of the KCCQ, the definitions of HRQOL and its domains, and the appropriateness of

questionnaire items. The discussions were held by e-mail because the two experts were living in Taiwan and consensus was reached. The experts agreed that the concept HRQOL in KCCQ fit both Chinese and Taiwanese cultures and all 23 items of the KCCQ should be translated into Chinese- Mandarin.

Translation of the KCCQ. Two trilingual Taiwanese doctoral students in nursing who spoke English, Chinese, and Taiwanese and who were familiar with both American and Taiwanese cultural nuances translated the English version of the KCCQ into Chinese-Mandarin independently of each other. Since most Taiwanese people older adults speak only Taiwanese and often have rudimentary literacy skills, it was necessary to make the items in the Chinese-Mandarin version of the KCCQ meaningful and natural sounding to native speakers of both Mandarin and Taiwanese. The translators were asked to preserve the meaning of the original English version rather than follow the exact wording (Lange, 2002). In addition, they were asked to translate the KCCQ into the Taiwanese language so as to maintain the meaning of each item as well as the scale as a whole. They were also encouraged to use more idiomatic language that would be better understood by the participants (Streiner & Norman, 2003).

The two translators found that four terms were difficult to translate into Chinese-Mandarin: (1) no appropriate term could be used to translate the phrase "walking a block," thus, "walking a section of street (block)" was used; (2) most Taiwanese use the Chinese terms "tired" and "fatigue" interchangeably, therefore, it was difficult to distinguish symptoms of "fatigue" from those of "tired," although the Chinese characters for these two words are slightly different; (3) literal translation for the term "enjoyment of life" was not appropriate because many Taiwanese interpret the term "enjoyment of life" as boasting, based on a cultural convention against the overt mention of enjoying activities; (4) the term "carrying groceries" was not a fit for elderly people who are not

responsible for shopping foods and other items for families.

Because some terms were translated differently by the two translators, discussions were held to achieve a consensus and produce the first translated version. However, since it was not clear whether the translated version could be understood by Taiwanese HF patients, questions about the clarity and terms, particularly four terms above, were proposed and discussed in the cognitive interview and focus group discussion.

Back-translation of the KCCQ. Two additional trilingual Taiwanese translators who had no knowledge (professional or otherwise) of the KCCQ and its purpose, independently back-translated the KCCQ from Chinese-Mandarin to English. One back-translator was a doctoral candidate in foreign language with research focusing on translation and interpretation, and the other one was a doctoral student in nursing who finished her bachelor and master degrees in the US. After discussing the differences between these two back-translated versions with the two back-translators, the principal investigator finalized the Chinese-Mandarin and back-translated versions.

Next, the principal investigator invited the developer of the KCCQ, Dr. John Spertus (M.D., MPH, FACC), to examine the differences between the original and translated versions of the KCCQ. Based on his comparison, the Chinese-Mandarin version of the KCCQ was modified to produce the most accurate and appropriate translation of the KCCQ questions. Dr. Spertus indicated that semantic equivalents for each item were found in going between the original and back-translated versions. Several response options in the back-translated version could have same meaning in Chinese as those in the original version. However, they were awkwardly stated in English, e.g. “medley” in the back-translated vs. “mildly” in the original and “not much sure” in the back-translated vs. “not very sure” in the original. The back-translated version, thus, was modified according to the recommendations from Dr. Spertus.

Cognitive interviews. Six bilingual Taiwanese people with HF were invited to individually evaluate the completion time, readability, clarity, and understandability of the KCCQ. Participants were encouraged to think-aloud and repeat back information in their own words, and they were asked specific questions about their understanding of the questionnaire (for example, what does "enjoyment of life" or "walking a block" mean to you after we review this question?) (Jobe & Mingay, 1989). The investigator observed and audio-taped all participant responses. Suggestions and opinions were used to modify the Chinese-Mandarin version of KCCQ.

Of the six participants, two were female and four were male. Ages ranged from 26 to 74 years with a mean of 52.04 years, LVEF .17 to .79 (with a mean of .47), and NYHA Classes from I to IV. Only one participant was diagnosed with diastolic dysfunction. All participants had at least one comorbidity, such as coronary artery disease, diabetes, or hypertension. One participant had a spinal cord injury for 25 years, and one had mitral regurgitation with severe ascites for six years. Four were married and two were single. One lived alone. Four participants graduated from elementary school; two from high school.

Participants stated that they understood the meaning of items of the KCCQ. However, most said that they could not verbally repeat the questions after hearing them read by the principal investigator as recommended by Jobe and Mingay (Jobe & Mingay, 1989). They answered the questions directly (Levine, Fowler, & Brown, (2005). For example, after listening to the sentence in question 1, "some feel shortness of breath while others feel fatigue," one participant said "I do have shortness of breath but not fatigue," whereas another participant said she had both, and described how these two symptoms affected her daily life. Likewise, two participants said HF affects several aspects of their lives, while one participant said it affected his exercise tolerance only. For

item 9, "… to sleep sitting up in a chair or with at least three pillows to prop you up because of shortness of breath?," participants answered that they used 2 or more pillows or quilts rather than three pillows. For question 10 concerning how to deal with HF when it gets worse, many participants answered that they would call their families or 911 and then go to emergency room immediately. Otherwise, they did not know what further steps to take.

For the question 12 regarding limitation of "enjoyment of life," one participant answered, directly "many limitations! Diet and water intake are the most affected." A female participant age 40 said, "effects of HF on enjoyment of life in younger people certainly are more severe than on older adults. Younger people have many responsibilities. I have to take care of my kids and do household chores. I live with my parents-in-law. I do everything I can do, even though I feel so tired and physical uncomfortable." For item 13, "if you had to spend the rest of your life with your heart failure the way it is right now, how would you feel about this?," participants had difficulties with the response choices about "satisfaction." Thus, the question was modified to "if you…, how satisfied would you feel about this?" When asked this question, the participant with a spinal cord injury, immediately answered, "I would be unsatisfied, life has become meaningless…I have so many complications. HF is the most serious disease. If the person can walk, the life is perhaps all right, but I cannot. It is not necessary to live longer. Isn't the disease too tiring? I feel so tired."

Some participants said that the meanings of certain terms seemed ambiguous. One participant identified "shortness of breath" not "short" but "rapid." Therefore, a more general term "pant" used by Taiwanese people was parenthesized after the term "short of breath." Similarly, "edema" was parenthesized after the term "ankle swelling," and "tired" was parenthesized after the term "fatigue." Two participants stated that they did

not really understand the meaning of "walking a section of street (block);" therefore, the phrase "walking from an intersection to next intersection" was parenthesized after the phrase "walking a section of street (block)." Another participant explained the phrase "intimate relationships with loved ones" as "loving each other and providing necessities including both physical and psychological," while others construed the phrase to mean "building good relationships with families." The loved ones included families rather than a spouse or a partner only. However, two participants interpreted the term "intimate relationships" as "having sex with spouse."

The participants said they could distinguish the differences between scale options for items of the KCCQ. However, they interpreted the options in different ways. For example, one participant indicated the option of "extremely limited" as 85 to 100% of limitation, "quite a bit limited" as 70-85%, "moderately limited" as 50-60%, "slightly limited" as lower than 50%, and "not at all limited" as 0%. Some participants rated situations that they did not dare to do anymore in the option of "extremely limited" or "extremely bothered" situations, while others scored them in the level of "did not do the activity." However, some participants, especially female, said they were still engaging in those extremely limited activities everyday even though those activities caused them extreme discomfort. Furthermore, for item 13 assessing the emotional response to the prospect of living with HF, one participant suggested an option of "slightly satisfied" vs. "mostly dissatisfied" in the original version of the KCCQ.

In summary, the cognitive interviews suggested that participants interpreted terms and scale options differently based on their own experiences and situations living with HF. Parenthesizing more general terms used by Taiwanese, including "pant," "tired," and "edema" after the literally translational terms may help Taiwanese participants to understand the items of the KCCQ and diminish the cultural differences between the

Chinese-Mandarin and English versions of the KCCQ. Furthermore, there is a need to make the scale responses for items of the Chinese-Mandarin version more distinguishable. Likewise, question 9 should be modified to "...or with quilt or with more pillows than usual (for example, 2 or more).

Focus group discussion. Four participants took part in the focus group discussion, three of whom had also participated in the cognitive interviews, along with another participant with HF, to examine the item equivalence of the Chinese-Mandarin version of the KCCQ. All participants were male with systolic dysfunction. They ranged in age from 26 to 70 years old, NYHA Classes I to IV, and LVEF from .17 to .61. Three were married and one was single. All lived with families. Two had completed elementary school, and two had graduated from high school. Three were retired, and the other participant had been forced to quit work because of HF. Three participants had HF secondary to dilated cardiomyopathy (DCM), while the other suffered from valvular heart disease and coronary artery disease. No other major comorbidity was reported by the four participants. The mother of the youngest participant also joined the group discussion. A 90 minute, audio-taped discussion ensued.

The participants were asked to discuss the meaning of each item, judging them in terms of relevance, clarity, unambiguousness, and intelligibility. They also considered whether the Chinese-Mandarin version of the KCCQ correlated with the main themes of HRQOL (Streiner & Norman, 2003). The interview was held in a small private meeting room at the medical center, and was processed using the following set of interview questions: (1) Have you heard of the term “health-related quality of life? (2) Can you tell me what you think it means? (3) This questionnaire (KCCQ) includes eight domains, physical limitation, symptoms,…, and functional status, in your opinion, are the eight domains appropriate for health-related quality of life? (4) In you opinion, what domains

does the questionnaire not contain related to health-related quality of life? (5) In your opinion, what domains of health-related quality of life should be excluded from the questionnaire (KCCQ)? And (6) in your opinion, which item(s) on this questionnaire (KCCQ) is/are not appropriate for the term of health-related quality of life?

The focus group discussion was conducted with a basic qualitative descriptive study design (Sandelowski, 2000). Basic qualitative description occurs when researchers deliberately choose to describe a phenomenon in regard to a conceptual, philosophical, or other highly abstract framework. It is used when researchers look for descriptive validity, interpretive validity, an accurate accounting of phenomena or experiences that most people observing the same event would agree is accurate, or an accurate accounting of the meanings participants attributed to those phenomena or experiences that those participants would agree is accurate (Sandelowski, 2000). Basic qualitative description fit this current study because the researcher intended to seek the meaning of the concept and domains of HRQOL and items of the KCCQ given by Taiwanese people with HF.

The audiotaped discussion was transcribed in Chinese by the principal investigator. The transcription then received multiple readings to assure accurate interpretation of the participants' descriptions. Themes were extracted according to the interview questions. The principal researcher formulated meanings from the significant statements, and related the meaning to other statements and themes. Similar meanings were grouped together as supporting quotations. The quotations were then translated from Chinese into English (Patton, 2002).

All participants said that they had heard the term "quality of life." Only two, however, had heard of "health-related quality of life." In the opinion of all participants, health was the heart of HRQOL, meaning that an unhealthy body negates quality in life. HRQOL included eating, dressing, housing, transportation, education, and entertainment.

The highest level of HRQOL was that a person can "let everything down (放下 fang xia, in Chinese)." To achieve this goal, they said that a person should not (1) "worry about things they cannot control, and (2) "over-insist on his own opinions and ideas." All participants agreed that the eight domains and 23 items of the KCCQ were appropriate for measuring the concept HRQOL, although they also suggested domains of nutrition, environment, safety, freedom, economy, and politics.

Participants interpreted the domains of the KCCQ using their life experiences. They viewed physical limitation as the inability to do what they want to do. They said that they did not want to burden their families so that they would like to do everything by themselves if they had ability to do so. However, the ability to perform daily activities was most affected by HF symptoms. One participant said that he often got dizzy since he had been taking a medication for his heart disease, and had not traveled outside of Taiwan since his second heart attack five years ago, due to his worry about his symptoms reoccurring. For all participants, preventing the reoccurrence of symptoms and maintaining symptom stability were the most important among daily tasks. One participant said that he took medications every day since he had a bad experience in which, after discontinuing the medication treatment, such severe symptoms had occurred that he had almost had to receive a heart transplant. All agreed that they would not force themselves to do things that strained their physical abilities for fear that the HF symptoms would occur or get worse.

Regarding social functioning, three participants maintained their interests, such as traveling outside their hometowns or within Taiwan. They reported no difficulties driving a car or riding a motorbike. However, all married participants stated that HF decreased their interactions with friends and families, particularly with their wives. They said that they got angry easily if their wives talked or complained to them too much. To prevent

this, they tried to decrease conversations with their wives and others. Similarly, all participants agreed that maintaining psychological balance might be the hardest adjustment they had to make. Because of their susceptibility to emotional swings, they said they gradually lost the belief that they would achieve their ideal goals. However, if requested by others to do something, they still had confidence in their competence to perform such tasks, though, they might refuse to comply with those requests if it caused physical troubles. Three participants said that they were the most dominant person in their families (as a father and a husband). Due to the responsibilities of "managing the family," they kept everything going, and tried to not to worry too much about their real situations in order to maintain harmony of their families. Participants discussed the concept of "enjoyment of life," and the three older participants said that they had already enjoyed many things in their lives, thus, they did not feel sorrow over when they were told the diagnosis of HF by their physicians. One participant said that having a desire to live and living a life with ease were basic to the sense of enjoying life: "If a person is willing to live, he will feel life is colorful, then he will feel that it is easy to continue living." A sick person, according to the participants, should adjust her/his own emotion and life to make oneself happy.

In summary, the participants identified the relevance of the questionnaires to their quality of life in respect to the KCCQ domains of physical and social limitations, functional status, symptoms (severity, frequency, and stability), self-efficacy, and psychological functioning based on their experiences living with HF. However, they suggested that HRQOL should be more multidimensional and noted several factors contribute to influencing one's outlook on one's quality of life. Moreover, domains can interact with each other; for example, poor functional status affects emotion and further decreases social interactions with others. Therefore, it is necessary to see HRQOL as a

whole.

Phase Two

Psychometric testing. After the focus group interview, psychometric testing was conducted to test psychometric properties of the questionnaires. Each instrument was assessed for its internal consistency reliability and test-retest reliability. In addition, convergent validity of the KCCQ was assessed using the Taiwan version of the Medical Outcome Study Short Form-36 (SF-36) (Lu, Tseng, & Tsai, 2003). Thirteen participants completed the baseline measure with six questionnaires including the demographic questionnaire, KCCQ, SRHS, PSQI, ESS, and SF-36. Participants were interviewed individually by the principal investigator. The duration of the interviews was approximately 30 to 60 minutes. Eight of these participants completed a re-test measure with the same questionnaires (except for demographics) two weeks later. Five participants were interviewed at their home by the principal investigator, and the remaining three completed the re-test by themselves and then mailed the questionnaires back to the principal investigator. Only one participant had missing data (on the backside of all questionnaires) but completed them within five days and sent back when requested.

Thirteen participants (6 females and 7 males) with HF completed the baseline measure (see Table 4). The mean age was 65.03 (SD 13.22) with a range from 40 to 86 years. Ten participants (76.9%) were married, while three (23.1%) were widows/widowers. All participants were living with families. Educational levels varied, five participants (38.5%) were illiterate, and five had completed elementary school. Employment status was as follows: five participants (38.5%) were employed, four (30.8%) were non-employed due to diseases, and three (23.1%) were retired. Five participants perceived their financial status as poor, while eight answered they had sufficient economic condition. The time span from time of HF diagnosis was from 2

months to 16 years with a mean of 4.1 years. The majority (84.6%) were in NYHA Class II, and nine participants (69.2%) had at least two other comorbidities. The mean LVEF was .49 (SD .22) with a range from .17 to .87. Eight (61.5%) had systolic HF, and seven had diastolic dysfunction.

The quantitative data were analyzed by using the Statistical Package for the Social Sciences (SPSS) Version 14.0 for Windows (SPSS Inc., 2005). The individual and HF characteristics and major variables were analyzed for descriptive statistics, including means, standard deviations, frequencies, and percentages. Cronbach's alpha coefficients were used to calculate internal consistency reliability, and Spearman rho correlation coefficients were used to examine test/re-test reliability of the KCCQ, SRHS, PSQI, and ESS, and the relationships between the KCCQ subscales and the SF-36 subscales.

Descriptive data for the KCCQ, PSQI, and ESS scores for the 13 participants are shown in Table 5.

Table 5
Descriptive Data for the KCCQ, PSQI, and ESS Scores (n=13)

Questionnaires	Mean (SD)	Range	Minimal-Maximal	Skewness(SD)
KCCQ				
Physical Limitation	88.19 (16.02)	0-100	50.00-100.00	-1.60(.64)
Symptom Stability	51.92 (18.99)	0-100	.00-75.00	-1.48(.62)
Total Symptom	86.14 (11.75)	0-100	58.33-100.00	-.96(.62)
Self-Efficacy	55.77 (31.30)	0-100	.00-100.00	-.10(.62)
Quality of Life	78.21 (22.45)	0-100	25.00-100.00	-1.18(.62)
Social Limitation	83.33 (31.28)	0-100	.00-100.00	-2.21(.62)
Overall Summary	84.06 (16.78)	0-100	41.15-100.00	-1.70(.62)
Global PSQI core	5.69 (2.39)	0-21	2.00-10.00	.09(.62)
ESS score	6.46 (3.21)	0-24	1.00-11.00	-.10(.62)

Reliability of the questionnaires. Reliability for each questionnaire is shown in Table 6. Some participants could not distinguish scale response "not very" from "somewhat" and "occasionally" from "rarely." These scale responses were designed for items 10, 11, 13, and 14.

Table 6
Reliability for the KCCQ, SRHS, PSQI, and ESS

Instruments/ Subscales	Items	Cronbach's α (n=13)	Spearman rho for test-retest (n=8)
Kansas City Cardiomyopathy Questionnaire			
Overall summary score	20	.86	.60
Clinical summary score	13	.70	.62
Physical limitation	6	.64	.66
Symptom stability	1	NA	-.38
Symptom frequency	4	.21	.71
Symptom severity	3	.29	.47
Symptom total	7	.42	.67
Self-efficacy	2	.29	.15
Quality of life	3	.76	.59
Social limitation	4	.80	.94***
Self-Rated Health Subscale	4	.73	.67
Chinese Pittsburgh Sleep Quality Index	18	.64	.92**
Subjective sleep quality	1	NA	.50
Sleep duration	1	NA	.90**
Sleep latency	2	.74	.67
Habitual sleep efficiency	2	NA	.76*
Sleep disturbances	9	.60	.81*
Use of sleeping medication	1	NA	--
Daytime dysfunction	2	.97	.82*
Chinese Epworth Sleepiness Scale	8	.52	.70

Spearman rank correlation coefficients for convergent validity of the KCCQ are shown in Table 7. The predicted substantial associations between the KCCQ subscales and SF-36 subscales are underlined (Pettersen et al., 2005). Except for the associations between the KCCQ quality of life subscale and SF-36 general health subscale (r_s=.17), KCCQ social limitation subscale and SF-36 social functioning (r_s=.23), and KCCQ overall summary score and SF-36 social functioning (r_s=.05), the remaining 17 predicted associations between the KCCQ and SF-36 were from .46 to .94, and 12 were above .60, indicating that the KCCQ subscales had moderate to substantial associations with the SF-36.

For the four items of SRHS, Cronbach's alpha for internal consistency reliability was .73, and Spearman rank correlation coefficient for the two-week test/re-test reliability was .67. Cronbach's alpha for internal consistency reliability was .64 for the global PSQI (18 items), .74 for sleep latency (2 items), .60 for sleep disturbances (9 items), and .97 for

daily dysfunction (2 items). The two-week test/re-test reliability coefficient for the global PSQI was .92, and for the domains of the PSQI ranged from .50 (sleep quality) to .97 (daily dysfunction). However, the two-week test/re-test reliability for the item "use of sleep medication" was not calculated, because no participants answered positively to the question of sleeping medications usage in either baseline and re-test measures.

Table 7
Spearman Rank Correlation Between the KCCQ Subscales and the SF-36 Subscales

	Physical Function	Role-Physical	Role-Emotion	Bodily Pain	General Health	Vitality	Social Function	Mental Health
Physical Limitation	.94***	.77**	.30	.49	.63*	.80**	.10	.39
Symptom Stability	.13	-.09	.12	.34	.16	-.04	.10	.000
Total Symptom	.57*	.46	.15	.42	.68*	.53	-.10	.20
Self-Efficacy	.64*	.74**	.22	.49	.46	.52	-.10	.16
Quality of Life	.36	.53	.40	.09	.17	.80**	.05	.59*
Social Limitation	.66*	.57*	-.05	.42	.57*	.67*	.23	.40
Clinical Summary	.75**	.62*	.20	.48	.66*	.63*	-.07	.22
Overall Summary	.73**	.74**	.24	.44	.64*	.88***	.05	.46

Note: Predicted substantial associations are underlined.
*** Correlation is significant at the 0.001 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Cronbach's alpha for internal consistency reliability for the ESS was .52, and the two week test/re-test reliability coefficient was .70. Five participants, however, had difficulties answering the item "sitting and reading." Furthermore, the item "driving a car, while stopped for a few minutes in the traffic" in the Chinese version of the ESS was not meaningful to participants who did not drive a car. Likewise, several participants answered that they took daytime naps habitually.

Spearman rank correlation coefficients for associations between the key variables are shown in Table 8.

Table 8
Spearman Rank Correlations Between Major Variables (n=13)

Variables	Physical Symptom	Functional status	Psycho-logical	Social	KCCQ Overall	SRHS	PSQI	ESS
Age	-.545	-.564	.070	-.562*	-.516	-.317	-.436	.493
Gender	.413	.222	-.063	.382	.247	.383	-.104	-.541
Married	-.195	.199	.596*	.000	.146	.101	.197	.098
Education	.574*	.312	-.130	.361	.303	.342	.041	-.496
Employ	-.428	-.619*	-.410	-.536	-.574*	-.290	-.574*	.294
Financial	-.042	.052	.172	-.138	.000	.022	.256	-.128
Comorbidity	-.640*	-.768**	-.084	-.744**	-.651*	-.324	-.334	.426
Onset of HF	-.348	-.122	.480	-.234	-.080	.190	-.111	.557*
LVEF	.165	.014	-.341	-.027	-.110	-.088	-.499	-.302
HF type	.085	-.050	-.516	-.069	-.169	-.065	-.405	-.320
NYHA	-.122	-.312	-.142	.005	-.192	.014	-.278	-.211
SRHS	.599*	.792**	.570*	.676*	.853**			
PSQI	.208	.363	.174	.305	.258	-.139		
ESS	-.784**	-.559	-.047	-.621*	-.601*	-.527	-.006	

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Finalizing the KCCQ

Modifications of terms and scale options in the Chinese-Mandarin version of the KCCQ were further discussed with the back-translator whose major focused on foreign language translation and interpretation, and a doctoral candidate who majored in linguistics. The scale option "somewhat" was then translated with the meaning of "moderately" to make it more distinguishable from the option "not very" or "rarely." The Chinese-Mandarin and back-translated versions of the KCCQ were again sent to the original developer, Dr. Spertus. Because of concerns that the item "walking from an intersection to next intersection" might not match against the participants' environment, Dr. Spertus suggested a more appropriate alternative "walking 100 meters on level ground" for the item "walking a block on level ground." He agreed that all of the remaining modifications as translated should be suitable for the study.

Discussion

Several subscales of the KCCQ and the ESS had a low to moderate level of Cronbach's alphas (less than .60), lower than found in other research studies. The sample

was restricted in terms of characteristics, such as NYHA Class, however, that could be explained by the small sample size. A larger representative sample of the population is required for the formal data collection.

The pilot study suggested several issues, including social desirability, methods (self-reporting vs. interview), and other cultural issues have to be taken into account in HRQOL assessment. The study was held in a medical center where participants were referred by their physician, and interviewed in person by the principal investigator. They may have answered the questions with a desire to please. This suggests that the interviewer needs to stress that being in the study will not impact their treatment by their physician. Moreover, several participants completed the questionnaires either in family settings or with family present; it was not clear whether their responses were affected by this. A related factor involves response variances introduced by different settings and methods. For example, one participant answered in the baseline measure in his interview that he did not feel depressed after being diagnosed with HF. However, he indicated that he was depressed in the retest that he filled out by himself at home. It is not clear whether the responses resulted from differences in settings, family presence, interview effects, or true emotional changes in the previous two weeks.

There are also questions posed by the possible interference of culturally generated images of self-efficacy. For instance, some participants may have exaggerated their ability to deal with HF and its systems in order to shield themselves from "victim blaming," that is, being blamed by healthcare professionals for not knowing good self-care. For example, when asked if he understood the questions, one participant responded that although he had only graduated from high school, he continued to educate himself. Likewise, the Taiwanese convention of understating one's achievements and accomplishments to people as a sign of humbleness may affect responses to questions

worded to bring out honest self assessments (Cheng et al., 2001). For example, most participants said that the only thing they could do if their HF symptoms got worse was to go to emergency room, they did not know what further steps to take. However, when further clarifying the questions with them, they described various strategies to make them feel comfortable, such as, using oxygen, taking medications, seeking help from their families, and finding out and diminishing the causes. To mitigate potential effects, the principal investigator will explain that the questions are not going to be used to critique or judge the respondent in any way.

Because 5 participants were illiterate, they had difficulties answering the item "sitting and reading" of the ESS. Furthermore, few participants could answer the item "in a car, while stopped for a few minutes in the traffic." Therefore, the principal investigator contacted the translator of the Chinese version of the ESS, Dr. Chen, Ning-Hung. A decision was made to replace these two questions by asking about alterative situations, such as doing boring and monotonous tasks. Thus, the item, "driving a car, while stopped for a few minutes in the traffic" was modified as "driving or sitting in a car…" to make it a better match with people's real situations.

Based on the fact that several participants in the psychometric testing claimed to take daytime naps habitually, three items in respect to the prevalence, frequency and duration of daytime napping developed by the principal investigator were added into the ESS. In addition, body mass index was added into the demographic questionnaire for the main study because some participants, particularly those with greater body weight, said that they snored (Javaheri, 2006; Sin et al., 2003).

In summary, the pilot study demonstrated that the domains and items of the KCCQ were appropriate for the concept HRQOL based on the participants' perspectives. However, the pilot study suggested the need for modifications in wording and items of

the questionnaires, including the KCCQ, ESS, and demographic questionnaire, as well as the need to waive a signed consent form for the dissertation study. After these modifications of the tools and procedures to address cultural biases in responding, the questionnaires and data collection method proposed by this research were ready for use in Taiwanese people with HF.

Summary

This chapter provided a description of the methodology to be used for this proposed study. This study used a descriptive correlational design to answer the proposed research questions. The population and sample were Taiwanese people with HF. Information about psychometric properties for instruments, including the KCCQ, modified SRHS, PSQI, and ESS were described. A detailed explanation of data collection procedures and data analysis was provided. Finally, a description of the pilot study was given, including procedures for translating the KCCQ from English into Chinese-Mandarin, sample and procedures, construct validity for the KCCQ, and reliability for each instrument. The pilot study supported the feasibility of this main research study.

Chapter 4: Results

This chapter describes the results of the research study. The findings include the demographic characteristics, health-related characteristics, and the HF characteristics of the sample. The chapter then presents descriptive data for major variables and interpretations of the inferential findings specific to the relationships between the variables and predictors of HRQOL.

Description of Sample

A total of 134 participants with HF initially agreed to participate in this study. However, nine participants were excluded from the study, thus final sample was comprised of 125 people. Eight who were excluded said they did not know about their HF diagnoses until this study, even though they said that they understood their heart function was in decline and had been treated for heart conditions such as mitral regurgitation and coronary artery disease for sometime. The ninth participant did not finish the sleep questionnaires because of fatigue. Otherwise, all participants completed the questionnaires.

Demographic Characteristics of Participants

The demographic data for the final sample of 125 Taiwanese are summarized in Table 9. The mean age for the sample was 67.79 (*SD* = 12.19) with a median of 68.93 and a range of 29.78 to 86.86 years. The majority of the participants (70.4%) were married, and 29 (23.2%) were widows or widowers. One hundred and ten participants were living with families, while 15 were living alone. Educational levels varied; 38 participants (30.4%) were illiterate, and 36 (28.8%) had completed elementary school. Forty participants (32%) were employed or working, 55 (44.0%) were unemployed, and 30 (24.0%) were retired. Ninety-two participants (73.6%) answered that their economic conditions were sufficient for them to meet daily expenses, whereas 26 (20.8%) perceived

their financial status to be poor. Approximately half (52.0%) of the participants spoke Taiwanese only, and 44% could speak both Taiwanese and Mandarin.

Table 9
Demographic Characteristics of Participants (*n*= 125)

Variable	Categories	*n*	%
Age in years	< 40 years	3	2.4
	40-54.99 years	19	15.2
	55-64.99	24	19.2
	65-74.99	38	30.4
	≧75 years	41	32.8
Gender	Female	56	44.8
	Male	69	55.2
Marital Status	Married	88	70.4
	Widow/Widower	29	23.2
	Divorced/Separated	5	4.0
	Single	3	2.4
Living	Alone	15	12.0
Arrangement	With family	110	88.0
Education	Illiterate	38	30.4
	Illiterate, but less than 6 years	11	8.8
	Elementary	36	28.8
	Junior high school	14	11.2
	Senior high school	18	14.4
	Some college	4	3.2
	College degree and above	4	3.2
Employed Status	Yes	40	32.0
	No	55	44.0
	Retired due to illness	5	4.0
	Retired	25	20.0
Financial Status	Poor	26	20.8
	Enough	92	73.6
	Rich	7	5.6
Language	Taiwanese	65	52.0
	Mandarin	5	4.0
	Both	55	44.0

Heart Failure Characteristics

HF characteristics, including the type of HF, NYHA Functional Classification, prescribed HF medications, and time since the diagnosis of HF, are shown in Table 10. The results showed that 50 participants (40.0%) had systolic HF, 51 (40.8%) had diastolic dysfunction, and the remaining (19.2%) had valvular HF. The majority (72.0%) was in NYHA Class II, and 24% were in Class III. The mean number of prescribed HF

medications used was 3.58 (*SD* = 1.51). Approximately 25% of the participants took 4 HF medications daily, while those taking two and three prescriptions per day represented 20% each. Nine subjects used only one medication, and two received eight pills daily. The time since the HF diagnosis ranged from one month to 16 years, with a mean of 35.66 months (*SD* = 43.81). Approximately 28% of the sample reported they had been diagnosed with HF for 1 to 6 months, 21.6% for 2 to 5 years, and 19.2% for 1 to 2 years.

Table 10
Heart Failure Characteristics of the Participants (*n*= 125)

		Frequency	Percent
Type of HF	Systolic	50	40.0
	Diastolic	51	40.8
	Valvular	24	19.2
NYHA Class	I	3	2.4
	II	90	72.0
	III	30	24.0
	IV	2	1.6
Number of prescribed HF medications *Mean*=3.58, *SD*=1.51, *Range*=1-8			
	One	9	7.2
	Two	25	20.0
	Three	26	20.8
	Four	31	24.8
	Five	20	17.6
	Six	9	7.2
	Seven	1	.8
	Eight	2	1.6
Type of prescribed HF medications			
	Vasodilator	78	62.4
	Diuretics	63	50.4
	Angiotensin-receptor blocker	54	43.2
	Aspirin	53	42.4
	Calcium channel blocker	49	39.2
	Beta-Blocker	35	28.0
	Digitalis	33	26.4
	Aldosterone inhibitor	20	16.0
	Angiotensin-converting enzyme inhibitor	15	12.0
	Lipid-lower	11	8.8
	Blood thinner	10	8.0
	Anti-arrhythmia	10	8.0
	Alpha adrenergic antagonist	9	7.2
Time since diagnosed with HF (month) *Mean*=35.66, *SD*=43.81, *Range*=1-192			
	1-6 months	35	28.0
	6-12 months	17	13.6
	13-24 months (1-2 years)	24	19.2

25-60 months (2-5 years)	27	21.6
61-120 months (5-10 years)	13	10.4
>121 months (>10 years)	9	7.2

Health-Related Characteristics

Health-related characteristics included BMI, comorbidity, and perceived health. Data for each variable is described as follows.

Body mass index. The participants had a mean BMI of 25.55 kg/m^2 (*SD* = 4.37), ranging from 16.62 kg/m^2 to 40.83 kg/m^2. According to the Classification of Overweight and Obesity published by the Taiwan Department of Health, approximately 40% of the participants had normal weight, 20.8% were overweight, and 24.8% were mildly obese. Distribution of the BMI in this sample is shown in Table 11.

Table 11
Distribution of BMI in the Participants (*n*= 125)

	Frequency	Percent
Mean=25.5 kg/m^2, *SD*=4.37, Skewness= .63, *SD*=.22		
≦18.4	1	0.8
18.5-23.9 (normal)	50	40.0
24-26.9 overweight	26	20.8
27-29.9 mild obesity	31	24.8
30-34.9 moderate obesity	14	11.2
≧35 severe obesity	3	2.4

*Based on the Classification of Overweight and Obesity by Taiwan Department of Health

Comorbidity. The study used both self-report Charlson Comorbidity Index (Katz et al., 1996) and chart-review methods (Radford et al., 2005) to measure comorbidity. If HF is excluded, Charlson comorbidity severity scores ranged from 0 to 8, with a mean score of 2.39 (*SD* = 1.88). Thirteen participants (10.4%) had a Charlson comorbidity score of 0. The mean number of comorbidities measured by the Charlson Comorbidity Index (CCI) was 1.86 (*SD* = 1.25). Approximately 38.4% of the participants reported they had had a heart attack, including angina pectoris and myocardial infarction, and 31.2% had diabetes with or without end organ damage. Twenty-nine participants reported they were receiving treatments for gastrointestinal problems and 25 (20.0%) for chronic

pulmonary diseases. Likewise, 19 participants complained they suffered from osteoarthritis (n = 18) and polymyostitis (n = 1), which are types of connective tissue diseases (Encyclopædia Britannica, 2007). Thirteen participants had a history of strokes or transient ischemic attacks, and three had the complications of hemiplegia; however, they could walk using assisting devices such as canes or walkers. Three participants were receiving hemodialysis treatment regularly. The CCI scores and comorbid conditions measure by the CCI are shown in Table 12.

Table 12
CCI Score and Comorbid Condition of the Participants (n=125)

	Frequency	Percent
CCI—Severity (Mean=2.39, *SD*=1.88, Skewness=1.08, *SD*=.22)		
CCI—Number (Mean=1.86, *SD*=1.25, Skewness=1.25, *SD*=.22)		
Zero	15	12.0
One	39	31.2
Two	36	28.8
Three	24	19.2
Four	5	4.0
Five	6	4.8
CCI--Comorbid condition		
Heart attack	48	38.4
Ulcer disease	29	23.2
Chronic pulmonary disease	25	20.0
Chronic renal disease	24	19.2
Diabetes without end organ damage	23	18.4
Liver disease	22	17.6
Connective tissue disease	19	15.2
Stroke, transient ischemic attack	16	12.8
Diabetes with end organ damage	16	12.8
Peripheral vessel disease	6	4.8
Hemiplegia	3	2.4
Dementia	1	.8
Cancer	1	0.8

The mean number of chart-review concomitant health problems was 4.88 (*SD* = 1.83, with a range of one to 10), which included both cardiovascular problems, ranging from one to seven with a mean of 3.05 (*SD* = 1.16), and noncardiovascular problems, ranging from 0 to 6 with a mean of 1.83 (*SD* = 1.46). In addition to HF, approximately 65.6% of the participants had hypertension, 56.0% had valvular heart disease, 44% had

coronary artery disease, 41.6% had atrial arrhythmia, and 32.8% had problems with high cholesterol or triglycerides. For 13 (10.4%) of the participants, HF was caused by dilated cardiomyopathy, and for three (2.4%) participants, it was caused by hypertrophic cardiomyopathy. Information about the chart-review concomitant cardiovascular problem is given in Table 13.

Table 13
Chart-Review Concomitant Cardiovascular Problems of the Participants (n= 125)

	Frequency	Percent
Number of concomitant cardiovascular problems		
One	10	8.0
Two	30	24.0
Three	45	36.0
Four	28	22.4
Five	9	7.2
Six	2	1.6
Seven	1	.8
Type of concomitant cardiovascular problems		
Hypertension	82	65.6
Valvular heart disease	70	56.0
Coronary artery disease	55	44.0
Atrial arrhythmia	52	41.6
Dyslipidemia	41	32.8
Percutaneous coronary intervention	14	11.2
Cardiomegaly	14	11.2
Dilated cardiomyopathy	13	10.4
Myocardial infarction	12	9.6
Ventricular arrhythmia	6	4.8
Rheumatic heart disease, surgical post	4	3.2
Angina pectoris	4	3.2
Coronary artery bypass graft	3	2.4
Hypertrophic cardiomyopahty	3	2.4
Left ventricular hypertrophy	3	2.4
syncope	2	1.6
Coronary spasm	1	.8
Peripheral arterial disease	1	.8
Carotid atherosclerosis	1	.8
Pulmonary hypertension	1	.8

The list of chart-review concomitant health problems was based on the ACC/AHA national key data elements (Radford et al., 2005) and used to measure more comprehensive comorbid conditions that were not measured by the CCI. The

chart-review approach presents prevalence of diabetes and cancer similar to those measured by the self-report method (see Table 14). The results showed that over one-third (36.8%) participants had at least one musculoskeletal problem such as gout (15.2%), osteoarthritis (12.8%), and spondylosis (6.4%), and this type of problem accounting for the most common comorbid conditions for this sample. The second most prevalent problem was diabetes, which affected 31.2% of the participants. Next, over one-fourth (25.6%) of the participants had gastrointestinal problems, including gastric/peptic ulcer (8.0%), abnormal liver functions (7.2%), and hepatitis (7.2%). Approximately 31 of the participants (24.8%) had at least one chronic pulmonary disease, which included 13.6% with chronic obstructive pulmonary disease and 6.4% with chronic bronchitis. There were 22 participants (17.6%) with neurological problems and 17 with chronic renal insufficiency. Ten of the participants (8.0%) had suffered from chronic pain, such as headache and lower-back pain, for a period of time, and eight were bothered by insomnia. Likewise, 9.6% had benign prostatic hyperplasia, resulting in a high frequency of nocturia.

Table 14
Concomitant Non-Cardiovascular Problems of the Participants (n= 125)

	Frequency	Percent
1. Musculoskeletal disease	n=44	36.8
Gout /Gouty arthritis	19	15.2
Osteoarthritis	16	12.8
Spondylosis	8	6.4
Osteoporosis	7	5.6
Herniation of intervertebral disc	2	1.6
Ankyolosing spondylitis	1	.8
Polymyositis	1	.8
Frozen shoulder	1	.8
2. Diabetes/high blood sugar	n=39	31.2
3. Gastrointestinal Disease	n=32	25.6
Gastric ulcer/ peptic ulcer	10	8.0
Abnormal liver function	9	7.2
Hepatitis	7	5.6
Gastrointestinal upset	7	5.6
Hemorrhoid	4	3.2

Table 14 (Continued)

	Frequency	Percent
Constipation	3	2.4
Liver abscess	2	1.6
Liver cirrhosis	2	1.6
Reflex esophagitis	1	.8
4. Chronic Pulmonary Diseases	*n*=31	24.8
Chronic obstructive pulmonary disease	17	13.6
Chronic bronchitis	8	6.4
Allergic rhinitis	3	2.4
Emphysema	2	1.6
Respiratory failure	2	1.6
Pleural effusion	2	1.6
Asthma	1	.8
Sleep apnea	1	.8
Old tuberculosis	1	.8
5. Neurological Disease	*n*=22	17.6
Transient ischemic attack	6	4.8
Stroke/Cerebrovascular accident	5	4.0
Parkinsonism	2	1.6
Hearing impairment	2	1.6
Meniere's syndrome	2	1.6
Dementia	1	.8
Cerebral atrophy	1	.8
Polyneuropathy	1	.8
Epilepsy	1	.8
6. Renal Disease	*n*=19	17.6
Chronic renal insufficiency	17	13.6
Hemodialysis	3	2.4
Hydronephrosis	1	.8
Proteinuria/ hypoalbuminemia	1	.8
7. Psychological /Mental Health		
Pain	10	8.0
Insomnia	8	6.4
Anxiety	2	1.6
Depression	1	.8
Neurosis	1	.8
8. Thyroid	4	3.2
Hyperthyroidism	2	1.6
Goiter	2	1.6
9. Cancer	1	.8
10. Other		
Benign prostatic hyperplasia	12	9.6
Cataract/Glaucoma	5	4.0
Anemia	4	3.2
Pancytopenia	1	.8

Perceived health. Perceived health was measured using the SHRS. The total score for the 4-item SHRS ranges from 4 to 13, with higher scores indicating better health

perception. For this study, the SHRS score ranged from 4 to 11 with a mean of 7.18 (SD = 1.70). Data for the 4-item SHRS are listed in Table 15. However, as described in Chapter three, Cronbach's alpha for the 4-item SRHS was .44. Two items, items 3 and 4, were eliminated from the data analysis with inferential statistics because they showed low corrected item-total correlations. The modified 2-item SRHS score ranged from 2 to 7 with a mean of 3.26 (*SD* = 1.07).

Table 15
SHRS Scores of the Participants (n = 125)

	Mean (SD)	Median	Mode	Range	Skewness (SD)	Kurtosis (SD)
Modified SRHS	3.26 (1.07)	3.00	2	2-7	.49 (.22)	-.22 (.43)
SHRS	7.18 (1.70)	7.00	8	4-11	-.03 (.22)	-.44 (.43)
Perceived overall health	1.70 (.56)	2.00	2	1-4	.31 (.22)	1.12 (.43)
Health compared to 1 year ago	1.57 (.72)	1.00	1	1-3	.87 (.22)	-.58 (.43)
Health problems limiting ability to do the things they wanted	2.12 (.79)	2.00	3	1-3	-.22 (.22)	-1.36 (.43)
Compared with most people's health in the same age	1.79 (.70)	2.00	2	1-3	.31 (.22)	-.92 (.43)

Table 16 presents descriptive data for each item of the SHRS. Generally, 62% of the participants evaluated their overall health as fair, and 34% rated it as poor. Approximately 56.8% of the subjects reported that their health was poorer than it was one year ago and 13.6% perceived that their health was better. Forty-seven (37.6%) participants believed that their health problems did not limit their ability to do the things they wanted, whereas 25.6% reported a large number of restrictions. However, participants had different interpretations for item 3. Several participants stated that they were too old to pursue their dreams or goals, particularly since they were living with severe illnesses. Nearly half of the participants viewed their health as being as good as that of most people their age, and 36.8% said their health was poorer than that of most of their peers. However, several participants expressed that they did not know how to answer question 4 because it was not easy to do the comparisons with other people's health. Those participants believed that their health was poorer when comparing with peers who could

do many things with low limitations, such as, walking, traveling, and doing chores in their farms. On the other hand, they also felt they had better health than that of others when comparing to those people who had to use canes or wheelchairs for walking or suffered from other more vulnerable situations, such as hemodialyisis or cancer with frequent chemotherapies. Particularly, participants who were over 80 years old described that their health should be better than that of their peers even though they had severe declines in daily functioning because most of their peers had died.

Table 16
Perceived Health of the Participants (*n*=125)

	n	%
Perceived overall health		
Poor	43	34.4
Fair	78	62.4
Good	3	2.4
Excellent	1	.8
Compared health to 1 year ago		
Not as good	71	56.8
Same	37	29.6
Better	17	13.6
Health problems limiting ability to do the things they wanted		
A great deal	32	25.6
A little	46	36.8
Not at all	47	37.6
Compared with most people's health in the same age		
Not as good	46	36.8
Same	59	47.2
Better	20	16.0

Research Questions

This section describes the findings of the analysis for each of the four research questions of this study. Tables are used to clarify the analytical results.

Question 1. *What are the sleep characteristics reported by Taiwanese people living with HF?*

Nocturnal Sleep Quality

Nocturnal sleep quality was measured with the PSQI. For each of the seven

components of the PSQI, the possible score ranges from 0 to 3. The desired score is 0 or 1. The total score can range from 0 to 21, with a higher score indicating poor sleep quality. The global PSQI scores of the 125 participants ranged from 0 to 20, with a mean score of 9.06 (*SD* 4.64), a median of 8.00, and a mode of 4.00. With a cutoff point of 5 (Buysse et al., 1989), 93 (74.4%) participants were identified as poor sleepers (PSQI > 5) and 32 (25.6%) as good sleepers. Approximately half of the participants, however, rated their sleep as fairly good, and only 42.8% rated their sleep as fairly bad or very bad. For the PSQI components, the score of sleep latency was the highest, and use of sleeping medication had the lowest score. The global and component scores of the PSQI for the 125 participants are summarized in Table 17.

Table 17
Global PSQI and Component Scores of the Participants (n=125)

	Mean (SD)	Median	Mode	Range	Skewness (SD)	Kurtosis (SD)
Global PSQI	9.06 (4.64)	8.00	4	0-20	.24 (.22)	-.85 (.43)
Sleep latency	1.71 (1.12)	2.00	3	0-3	-.25 (.22)	-1.32 (.43)
Sleep duration	1.70 (1.04)	2.00	2	0-3	-.32 (.22)	-1.05 (.43)
Subjective sleep quality	1.55 (.91)	1.00	1	0-3	.36 (.22)	-.87 (.43)
Sleep disturbances	1.46 (.59)	1.00	1	0-2	.14 (.22)	-.41 (.43)
Habitual sleep efficiency	1.42 (1.29)	1.00	0	0-3	.10 (.22)	-1.70 (.43)
Daytime dysfunction	.71 (1.03)	0.00	0	0-3	1.13 (.22)	-.17 (.43)
Use of sleeping medication	.50 (1.08)	0.00	0	0-3	1.79 (.22)	1.37 (.43)

Findings for the seven components of the PSQI are shown in Table 18. Overall, the mean daily sleep duration was 5.62 hours (*SD* = 1.72 hours). Thirty-six percent of the participants reported they had a total night's sleep of 5 to 6 hours, and 25.6% slept less than 5 hours a night. The mean sleep latency was 46.02 minutes (*SD* = 57.63 minutes). Approximately 40.8% of the participants took less than 15 minutes to fall asleep, whereas 19.2% took more than 1 hour to fall asleep. The mean habitual sleep efficiency was 73% (*SD* = 22%). Forty-seven (37.6%) had habitual sleep efficiencies of 85%, and 32.8% had sleep efficiencies of less than 65%. A large proportion (80.8%) of the participants did not use sleeping medications, whereas 14.4% took sleeping pills three or more days a week

during the last month. Similarly, most participants (62.4%) reported they did not suffer from daytime dysfunction, whereas 9.6% had severe problems performing their daily functions.

Table 18
Descriptive Data for Seven Components of Nocturnal Sleep Quality (n=125)

Components of PSQI	Frequency	Percent
Subjective sleep quality		
Very good	10	8.0
Fairly good	62	49.6
Fairly bad	27	21.6
Very bad	26	20.8
Sleep duration (mean=5.62 [*SD* 1.72], median=5.5, mode=5.0 hours)		
Over 7 hours	22	17.6
Over 6 hours, less than 7 hours	26	20.8
Over 5 hours, less than 6 hours	45	36.0
Less than 5 hours	32	25.6
Sleep latency (mean=46.02 [*SD* 57.63], median and mode=30 minutes)		
Equal or less than 15minutes	51	40.8
16-30minutes	32	25.6
31-60minutes	18	14.4
Greater than 60minutes	24	19.2
Habitual sleep efficiency (mean=73% [*SD* 22%], median=76%, mode=100%)		
Equal or greater than 85%	47	37.6
84-75%	19	15.2
74-65%	18	14.4
Less than 65%	41	32.8
Sleep disturbances		
0	3	2.4
1-9	64	51.2
10-18	55	44.0
19-27	3	2.4
Use of sleeping medication		
Not during the past month	101	80.8
Less than once a week	3	2.4
Once or twice a week	3	2.4
Three or more times a week	18	14.4
Daytime dysfunction		
No problem at all	78	62.4
Only a very slight problem	17	13.6
Somewhat of a problem	18	14.4
A very severe problem	12	9.6

Regarding sleep disturbances, only three participants stated that they did not suffer from any kind of sleep disruption during the past month. For an understanding of

the prevalence of sleep disturbances in this sample, the total frequency for each condition relating to sleep disturbances was calculated by summing the scores 2 and 3. As shown in Table 19, the most frequent event regarding sleep disturbances was "have to get up to use the bathroom at least one to three or more times a week." That type of sleep disruption was reported by 104 participants (83.2%). Among those participants, 99 had episodes of nocturia three or more nights a week. Several participants mentioned that they had two or more episodes of nocturia every night. The second most prevalent condition related to sleep disturbances was "cannot get to sleep within 30 minutes," which occurred in 62.4% of the participants. Approximately half of the 125 participants (52.8%) had difficulties initiating sleep within 30 minutes three or more nights a week. The next most prevalent event for this sample was "wake up at midnight or early morning," which affected 70 (56.0%) of the participants, with 54 participants aroused from sleep at midnight or during the early morning three or more times a week.

Thirty-four (27.2%) of the participants complained they had dreams during sleep that resulted in their feeling a lack of refreshing sleep when getting up in the morning. Twenty-eight (22.4%) experienced pain while sleeping. The most common causes of pain were muscle cramp, muscle pain, and chest discomfort. One-fifth of the participants (20.8%) stated that they coughed or snored loudly during sleep occasionally or frequently. Several participants, however, said they had difficulties answering this question because they did not know whether they snored during sleep every night. Twenty-three (18.4%) of the participants reported they could not breathe comfortably and had to use more pillows to prop themselves up for sleep or they had to sleep in a lateral position. Finally, conditions such as feeling too cold or too hot and having dry mouth bothered a small number of participants.

Table 19
Conditions Regarding Sleep Disturbances of the Participants (n=125)

Condition	Score	Mean (*SD*)	0 *n* (%)	1 *n* (%)	2 *n* (%)	3 *n* (%)	Total for 2-3 *n* (%)
Have to get up to use the bathroom		2.51 (1.29)	14 (11.2)	7 (5.6)	5 (4.0)	99 (79.2)	104 (83.2)
Cannot get to sleep within 30 minutes		1.90 (1.29)	32 (25.6)	15 (12)	12 (9.6)	66 (52.8)	78 (62.4)
Wake up at midnight or early morning		1.63 (1.35)	45 (36.0)	10 (8.0)	16 (12.8)	54 (43.2)	70 (56.0)
Had bad dream		.92 (1.25)	73 (58.4)	18 (14.4)	5 (4.0)	29 (23.2)	34 (27.2)
Have pain		.66 (1.14)	90 (72.0)	7 (5.6)	9 (7.2)	19 (15.2)	28 (22.4)
Cough or snore loudly		.63 (1.10)	89 (71.2)	10 (8.0)	9 (7.2)	17 (13.6)	26 (20.8)
Cannot breathe comfortably		.52 (1.01)	95 (76.0)	7 (5.6)	11 (8.8)	12 (9.6)	23 (18.4)
Feel too hot		.25 (0.72)	109 (87.2)	7 (5.6)	3 (2.4)	6 (4.8)	9 (7.2)
Feel too cold		.21 (0.73)	109 (87.2)	9 (7.2)	0 (0.0)	7 (5.6)	7 (5.6)
Other reasons	Dry mouth	.41 (0.98)	1 (0.8)	1 (0.8)	2 (1.6)	10 (8.0)	1 (0.8)
	Stress		0 (0.0)	4 (3.2)	0 (0.0)	1 (0.8)	4 (3.2)
	Palpitation		0 (0.0)	0 (0.0)	0 (0.0)	1 (0.8)	0 (0.0)
	Itching		0 (0.0)	0 (0.0)	0 (0.0)	1 (0.8)	0 (0.0)

* Score 1: not during the past month; Score 2: less than once a week; Score 3: once or twice a week; Score 4: three or more times a week

Daytime Sleepiness

Daytime sleepiness was measured with the ESS. The total range of scores on the ESS is 0 to 24, with higher scores indicating that the participants were more likely to fall asleep or doze off in sedentary life situations. In this study, the ESS scores ranged from 0 to 22, with a mean score of 6.99 (*SD* = 5.07), a median score of 6.00, and a mode score of 3.00. Overall, the findings indicated that the HF participants were not physically influenced by their daytime sleepiness. When a cutoff point of 10 was considered (Johns, 1991), most participants (76%) did not describe a high propensity to fall asleep in daily sedentary situations, while 30 (24%) of the participants had excessive daytime sleepiness. It is worth noting that, 9 (7.2%) of the participants had an ESS score of 16 or above, indicating a high level of daytime sleepiness. Regarding the eight special life situations, participants reported that they were most likely to fall asleep or doze off while "lying down to rest in the afternoon" (mean = 2.06, *SD* = 1.27), and the least daytime sleep propensity occurred in the situation of "sitting in a car, while stopped for a few minutes in the traffic" (mean = .07, *SD* = 34)." The ESS total score and scores for each situation are summarized in Table 20.

Table 20
ESS Scores of the Participants (n=125)

	Mean (SD)	Median	Mode	Range	Skewness (SD)	Kurtosis (SD)
ESS total	6.99 (5.07)	6.00	3	0-22	.79 (.22)	.10 (.43)
Lying down to rest in the afternoon	2.06 (1.27)	3.00	3	0-3	-.79 (.22)	-1.18 (.43)
Sitting quietly after a lunch without alcohol	1.36 (1.40)	1.00	0	0-3	.21 (.22)	-1.85 (.43)
Watching TV	1.18 (1.18)	1.00	0	0-3	.44 (.22)	-1.33 (.43)
As a passenger in a car for an hour without rest	.98 (1.29)	.00	0	0-3	.77 (.22)	-1.23 (.43)
Sitting and reading	.66 (1.06)	.00	0	0-3	1.30 (.22)	.18 (.43)
Sitting, inactive in a public place	.54 (1.00)	.00	0	0-3	1.75 (.22)	1.62 (.43)
Sitting and talking to someone	.13 (.54)	.00	0	0-3	4.51 (.22)	20.13 (.43)
In a car, while stopped for a few minutes in the traffic	.07 (.34)	.00	0	0-3	6.21 (.22)	46.18 (.43)

Frequencies of situations in which the participants reported a propensity to sleep are summarized in Table 21. A total score for the frequency for each situation was calculated by summing all frequencies of chance (slight, moderate, and high) to yield the total number of HF participants to fall asleep or doze off in that situation. The results showed that the top three situations causing daytime sleepiness within this sample were "lying down to rest in the afternoon," "watching TV," and "sitting quietly after a lunch without alcohol." In those three situations, 77.6% to 53.6% of the participants reported a propensity to fall asleep, with most of the participants rating their chances to doze off as high. Situations with lower frequencies were "sitting and talking to someone" and "in a car while stopped for a few minutes in the traffic," accounting for 6.4% and 5.6%, respectively.

Daytime Napping

The results showed that 102 (81.6%) of the participants reported they were prone to habitual daytime napping after lunch. Among them, 78 (62.4%) of the 125 participants took daytime naps everyday, and six took naps three to four days per week. Approximately five subjects stated that they had to take naps several times during daytime because of fatigue. The mean duration of daytime napping for the 102

participants who napped was 82.3 (*SD* = 50.42) minutes, with a range from 10 minutes to 240 minutes. Information about daytime napping among the participants is shown in Table 22.

Table 21
Frequencies for Situations Causing Daytime Sleepiness (*n*= 125)

Score	0	1	2	3	Total for 1-3
Situation	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)
Lying down to rest in the afternoon	28 (22.4)	12 (9.6)	10 (8.0)	75 (60.0)	97 (77.6)
Watching TV	50 (40.0)	29 (23.2)	19 (15.2)	27 (21.6)	75 (60.0)
Sitting quietly after a lunch without alcohol	58 (46.4)	13 (10.4)	5 (4.0)	49 (39.2)	67 (53.6)
As a passenger in a car for an hour without rest	72 (57.6)	15 (12.0)	6 (4.8)	32 (25.6)	53 (42.4)
Sitting and reading	83 (66.4)	15 (12.0)	13 (10.4)	14 (11.2)	42 (33.6)
Sitting, inactive in a public place	89 (71.2)	19 (15.2)	2 (1.6)	15 (12.0)	36 (28.8)
Sitting and talking to someone	117 (93.6)	3 (2.4)	2 (1.6)	3 (2.4)	8 (6.4)
In a car when stopped for a few minutes in the traffic	118 (94.4)	6 (4.8)	0 (.0)	1 (.8)	7 (5.6)

* Score 0: would never doze; Score 1: slight chance of dozing; Score 2: moderate chance of dozing; Score 3: high chance of dozing

Table 22
Daytime Napping of the Participants (n= 125)

	Frequency	Percent
Nap		
No	23	18.4
Yes	102	81.6
Frequency of daytime napping		
Everyday	80	64.0
5-6 days/week	4	3.2
3-4 days/week	12	9.6
1-2 day(s)/week	6	4.8
Duration of daytime napping (median and mode: 60 minutes)		
10-30 minutes	19	15.2
31-60 minutes	36	28.8
61-120 minutes	30	24.0
120-240 minutes	15	12.0

Question 2. *What is the perception of HRQOL among Taiwanese people living with HF?*

HRQOL was measured using the KCCQ where HRQOL is a conceptual model that comprises four domains: physical symptoms, functional status, psychological status, and social. An overall summary score was calculated by summing scores in those four

domains. The possible KCCQ domains and overall summary scores range from 0 to 100, with high scores indicating better HRQOL. The mean KCCQ overall summary score for the 125 participants was 70.50 (*SD* = 19.63), with a range from 11.98 to 95.83. The physical symptom domain had the highest score (mean = 73.98, *SD* = 21.31), and psychological status was the lowest (mean = 65.60, *SD* = 24.72). In addition to the four domains of the KCCQ, two other domains—symptom stability and self-efficacy—were used to help in the interpretation of the KCCQ for the participants with HF. Data of the KCCQ are shown in Table 23.

Table 23
KCCQ Scores of the Participants (n=125)

	Mean (SD)	Median	Mode	Range	Skewness (SD)	Kurtosis (SD)
Overall Summary	70.50 (19.63)	73.96	73.96	11.98-95.83	-.79 (.22)	-.11
Physical symptoms	73.98 (21.31)	78.13	100.00	6.25-100.00	-.78 (.22)	-.02
Frequency	66.70 (25.23)	68.75	100.00	4.17-100.00	-.45 (.22)	-.67
Burden	81.27 (21.89)	91.67	100.00	8.33-100.00	-1.28 (.22)	.89
Symptom stability	52.00 (19.73)	50.00	50.00	0.00-100.00	-.34 (.22)	1.33
Functional status	73.14 (23.70)	79.17	91.67	0.00-100.00	-1.21 (.22)	.91
Psychological status	65.60 (24.72)	66.67	83.33	0.00-100.00	-.52 (.22)	-.61
Social functioning	69.27 (25.08)	75.00	93.75	0.00-100.00	-.71 (.22)	-.33
Self-efficacy	77.70 (27.71)	87.50	100.00	0.00-100.00	-1.33 (.22)	.92

Physical Symptoms

Physical symptoms were measured with the KCCQ symptom total subscale, which included symptom frequency and symptom burden. Overall, the participants had a mean physical symptoms score of 73.98 (SD = 21.31). The score range varied from 6.25 to 100.00. It is worth noting that 14 (11.2%) of the participants had full scores (100) in the domain of physical symptom, indicating that they did not perceive any HF symptoms or symptom burdens over the past two weeks (see Table 24).

Symptom frequency. The mean score for the four-item symptom frequency subscale was 66.70 (SD = 25.23) with a range of 4.17 to 100. As shown in Table 24, 94 (75.2%) of the participants did not have swelling feet, ankles, or legs when awaking in

the morning, whereas 31 participants experienced the symptoms occasionally or everyday in the two weeks prior to their interviews for this study. Approximately 70% of the subjects reported that fatigue or tiredness stopped them from doing what they wanted to do during the previous two weeks. Eighty-five participants had experienced shortness of breath or dyspnea when doing activities such as working, walking, climbing stairs, and sitting. Additionally, during the previous two weeks one-fourth of the participants had to sleep in a chair or with a quilt or more pillows than usual to prop themselves up because of shortness of breath.

Table 24
Physical Symptom of the Participants (n=125)

	Mean (SD)	Possible Range		Frequency	Percent
Symptom frequency (mean = 66.70, SD = 25.23)					
Having swelling	4.13 (1.60)	1-5	Yes	31	24.8
			No	94	75.2
Having fatigue	4.33 (2.29)	1-7	Yes	87	69.6
			No	38	30.4
Having shortness of breath (SOB)	4.34 (2.16)	1-7	Yes	85	68.0
			No	40	32.0
Slept in a chair or with more pillows	4.10 (1.64)	1-5	Yes	30	24.0
			No	95	76.0
Symptom burden (mean = 81.27, SD = 21.89)					
Bothered by swelling	5.38 (1.22)	1-6	Yes	22	19.6
			No	103	80.4
Bothered by fatigue	4.46 (1.50)	1-6	Yes	55	44.0
			No	70	56.0
Bothered by SOB	4.23 (1.61)	1-6	Yes	71	56.8
			No	54	43.2

Symptom burden. The mean score of symptom burden was 81.27 (SD = 21.89). Symptom burden consisted of three items asking about burdens from the symptoms of swelling, fatigue, and shortness of breath in the two weeks prior to the interviews for this study. A large proportion (80.4%) of the participants stated that they were not bothered by the symptom of swelling during the previous two weeks. Forty-four percent of the participants reported that they suffered from the burden of fatigue, and 56.8% said that they experienced the burden of shortness of breath or dyspnea over the previous two

weeks. Overall, several participants answered that they did not perceive any symptom burden although they were living with one or more HF symptoms.

Symptom Stability

Stability was a single item that asked participants whether their symptoms had changed compared to what they were two weeks ago prior to the interviews for this study. Over 60% of the participants were living with stable conditions regarding their HF symptoms. Approximately 20% of this group noted that they felt a little better, and four participants reported they were much better, especially those who were recently discharged from the hospital. Eighteen participants felt a little worse or much worse compared to their conditions two weeks previously. Data for symptom stability are shown in Table 25.

Table 25
Symptom Stability of the Participants (*n*=125)

	Frequency	Percent
Much worse	6	4.8
A little worse	12	9.6
No change	77	61.6
A little better	26	20.8
Much better	4	3.2

Functional Status

Functional status was measured using the KCCQ physical limitation subscale. The average functional status score was 73.14 (SD = 23.70), with a range from 0 to 100. Functional status comprised six questions that asked participants to evaluate their limitations in performing six daily activities over the two weeks prior to the interviews for this study. The possible range was from 1 (extremely limited) to 5 (not limited). As shown in Table 26, the most difficult daily activities performed by the participants was "hurrying or jogging" (92.8%). Eighty-three participants reported slight to extreme limitations in doing yardwork or housework and carrying groceries. Several participants

mentioned that they did not even attempt to perform those tasks after being diagnosed with HF. Sixty percent of the subjects had problems with climbing stairs without stopping. Several participants mentioned that they still climbed stairs because their houses or apartments did not have elevators, even though they had a moderate to severe limitation in doing so. In contrast, some participants had stopped climbing stairs although they had only slight to moderate limitations in that activity. Fifty-seven (45.6%) of the participants stated that they had no difficulties walking on the level ground if there were no time limits; however, over half of the participants had limitations in walking one block (100 meters). Additionally, 22.4% to 26.4% of the participants perceived slight to extreme limitations in dressing and taking a shower or bath, and some had to depend on assistance of family members.

Table 26
Functional Status of the Participants (n= 125)

Activity	Mean (*SD*)	Possible Range	Lmt	Frequency	Percent
Dressing yourself	4.68 (.76)	1-5	Yes	28	22.4
			No	97	77.6
Showering/ Bathing	4.55 (.93)	1-5	Yes	33	26.4
			No	92	73.6
Walking 1 block on level ground	4.10 (1.10)	1-5	Yes	68	54.4
			No	57	45.6
Doing yardwork, housework or carrying groceries	3.75 (1.29)	1-5	Yes	83	66.4
			No	42	33.6
Climbing a flight of stairs without stopping	3.74 (1.44)	1-5	Yes	75	60.0
			No	50	40.0
Hurrying or jogging (as if to catch a bus)	2.67 (1.44)	1-5	Yes	116	92.8
			No	9	7.2

Psychological Status

Psychological status was assessed using the KCCQ quality of life subscale, which consisted of three items (see Table 27). The mean score for this domain was 65.60 (SD = 24.72). Approximately half of the participants perceived they had slight to extreme restrictions in their enjoyment of life over the two weeks prior to the interviews for this study because of lifestyle modifications, including eating low-salt or low-fat diets and

taking HF medications everyday, as well as adjusting to other limitations, such as those affecting their ability to travel inside or outside the country. Over 84% of the participants reported slight to complete dissatisfaction with the prospect of "spending the rest of your life with your HF the way it is right now." More than half of the subjects "felt discouraged or down in the dumps" about their HF. The frequency for that item ranged from only once or twice to all of the time over the previous two weeks.

Table 27
Psychological Status of the Participants (*n*=125)

	Mean (SD)	Range	Lmt	Frequency	Percent
Restriction in enjoyment of life	4.08 (1.18)	1-5	Yes	63	50.4
			No	62	49.6
Not satisfaction with spending the rest of life with HF	2.74 (1.50)	1-5	Yes	105	84.0
			No	20	16.0
Felt discouraged or down in the dumps	4.05 (1.11)	1-5	Yes	63	50.4
			No	62	49.6

Social Functioning

Social functioning was measured with the KCCQ social limitation subscale, which asked the participants to evaluate their limitations in carrying out four social activities over the previous two weeks (see Table 28). The possible range for each item was from 1 (severely limited) to 5 (not limited). Sixty-four percent of the participants had slight to extreme restrictions in taking part in hobbies and recreational activities, particularly in taking overnight trips. Approximately 83.2% had mild to great difficulties in working or doing household chores. More than half of the group had problems visiting family or friends. Among them, 17 (13.6%) of the participants stated that they had stopped visiting friends after being diagnosed with HF, and 27 (21.6%) needed the assistance of family members when they had to do so. Likewise, 25.6% of the participants perceived they had limitations to their ability to maintain intimate relationships with loved ones. However, it is worth noting that participants interpreted the term "intimate relationship" differently. Several participants explained this term as "doing

sexual activities with their spouses." In contrast, most participants recognized it as "maintaining relationship with their families," particularly for those people who had no spouses or stated that they did not have sexual activities with their spouses for a long time.

Table 28
Social Functioning of the Participants (*n*=125)

Activity	Mean (*SD*)	Possible Range	Lmt	Frequency	Percent
Doing hobbies, recreational activities	3.58 (1.46)	1-5	Yes	80	64.0
			No	45	36.0
Working or doing household chores	3.12 (1.43)	1-5	Yes	104	83.2
			No	21	16.8
Visiting family or friends	3.77 (1.49)	1-5	Yes	63	50.4
			No	62	49.6
Having intimate relationship with loved ones	4.61 (.90)	1-5	Yes	32	25.6
			No	93	74.4

Self-Efficacy

Self-efficacy was measured using the two-item KCCQ self-efficacy subscale. As shown in Table 29, the mean score for the 125 subjects was 77.70 (*SD* = 27.71). For the item "how sure are you that you know what to do, or whom to call, if your heart failure gets worse," 100 (80%) of the participants answered that they completely understood what they should do; for example, they knew to take certain medication, return to their physicians' clinics, or call 911. Overall, the participants had certain levels of confidence in dealing with their HF when symptoms recurred or got worse. Regarding their knowledge in preventing HF symptoms from getting worse, 44.8% of the participants reported that they completely understood what to do, whereas 21.6% stated that they did not quite understand or they did not understand at all.

Table 29
Self-Efficacy of the Participants (*n*=125)

	Mean	*SD*	Range
Sure what to do or whom to call, if HF gets worse	4.34	1.40	1-5
Understand what things can do to keep HF symptoms from getting worse	3.87	1.31	1-5

Question 3. *What are the relationships among HRQOL, sleep disorders, HF characteristics, and individual characteristics, including demographics and health-related characteristics?*

Relationships Among Sleep Variables

As shown in Table 30, the Pearson correlation coefficients for the relationships between global PSQI and its components ranged from .33 (daytime dysfunction) to .84 (sleep efficiency). Except for daytime dysfunction, the remaining domains showed significant correlations, although the relationships were low to moderate (r = .18 to .69). Subjective sleep quality was significantly correlated with all other PSQI domains ranging from .18 (p<.05, daytime dysfunction) to .64 (p<.001, sleep efficiency). Among the relationships between sleep latency and other PSQI domains, sleep efficiency had the highest association (r = .62, p<.001) and daytime dysfunction was the lowest (r = .07, p>.05). The associations between sleep duration and other PSQI domains ranged from .69 (p<.001, sleep efficiency) to .13 (p>.05, daytime dysfunction). Sleep efficiency was highly correlated with sleep quality (r = .64, p<.001), sleep latency (r = .62, p<.001), and sleep duration (r = .69, p<.001), moderately associated with sleep disturbances (r = .35, p<.01) and the use of sleeping medication (r = .26, p<.01), as well as lowly correlated with daytime dysfunction (r = .13, p>.05). Sleep disturbance had moderate to low correlations with other domains (r = .40 to .15). Daytime dysfunction, however, had a significant but small correlation only with subjective sleep quality (r = .21, p<.05). Additionally, the use of sleeping medication was lowly associated with other domains (r = .33 to r = .23).

In regard to the relationship between nocturnal sleep quality and daytime sleepiness, the ESS score was positively related to daytime dysfunction (.32, p<.001), indicating that the greater the daytime dysfunction, the more the HF participants

experienced daytime sleepiness. The prevalence, frequency, and duration of daytime napping, however, correlated neither with PSQI scores nor with ESS scores.

Table 30
The Relationships Among Sleep Variables (*n*=125)

Variables	1	2	3	4	5	6	7	8	9	10	11
1. Global PSQI											
2. Sleep quality	.78***										
3. Sleep latency	.74***	.54***									
4. Sleep duration	.73***	.46***	.37***								
5. Sleep efficiency	.84***	.64***	.62***	.69***							
6. Sleep disturbances	.61***	.45***	.45***	.35**	.47***						
7. Daytime dysfunction	.33***	.18*	.07	.13	.05	.13					
8. Sleeping medication	.52***	.33***	.25**	.26**	.28**	.21*	-.03				
9. CESS	.10	.09	-.07	.14	.03	.11	.32***	-.09			
10.Nap-prevalence	-.02	.02	-.10	.00	.03	.13	-.09	-.01	.02		
11.Nap-frequency	.05	.12	-.07	.02	.07	.11	-.06	.07	.03	.86***	
12.Nap- duration	-.03	-.02	-.02	-.16	-.09	.03	.05	.10	-.001	.00	.02

*p< 0.05 level, **p<.01 level, ***p< 0.001 level (2-tailed).

Relationships Among Domains of HRQOL

Table 31 presents the correlations among KCCQ domains and the overall summary score. The results showed that all domains were highly associated with the KCCQ overall summary score. In addition, the domains were significantly correlated with each other. The Pearson correlation coefficients ranged from .46 to .70, all representing significance levels less than .001. Symptom stability was significantly associated only with physical symptoms (r = .23, p<.05), meaning that the higher the score for symptom stability, the better the physical symptom score reported by the HF participants. Self-efficacy was not significantly related to any KCCQ domain in this sample (Pearson r from .10 to .15).

Table 31
Relationships Among Major Variables (*n*=125)

Variables	1	2	3	4	5	6
1. KCCQ overall						
2. Physical symptom	.85***					
3. Functional status	.86***	.70***				
4. Psychological status	.78***	.61***	.46***			
5. Social functioning	.83***	.54***	.70***	.50***		
6. Symptom stability	.15	.23*	.06	.14	.09	
7. Self-efficacy	.14	.10	.12	.12	.15	.13

*p< 0.05 level, ***p< 0.001 level (2-tailed).

Relationships Between Demographic Variables and HRQOL

Several significant but small correlations appeared between demographic data and the overall KCCQ summary score, functional status, and social functioning (see Table 32). Level of education, however, was the only demographic variable that had a significant association with physical symptom. Additionally, no demographic variable showed a correlation with psychological status.

Table 32
Relationships Between Demographics and HRQOL (*n*=125)

Variables	Age	Gender	Marital status	Living arrangement	Education	Employ-ment	Finance	Language
KCCQ overall	-.20*	.16	-.15	.01	.29**	-.03	.18*	.19*
Physical symptom	-.06	.16	-.06	-.06	.19*	.03	.11	.001
Functional status	-.32***	.10	-.23*	.06	.31**	-.12	.22*	.27**
Psychological status	.01	.16	-.03	-.02	.17	.12	.05	.10
Social functioning	-.29**	.10	-.18*	.05	.32***	-.11	.23*	.23*

*p< 0.05 level, **p<.01 level, ***p< 0.001 level (2-tailed).

Analyses for the relationships between each demographic variable and the KCCQ domains are as follows. Age had negative relationships with the KCCQ overall summary score (r = -.20, p<.05), functional status (r = -.32, p<.001), and social functioning (r = -.29, p<.01). Gender, living arrangement, and employed status showed no substantial associations with KCCQ scores. Marital status was correlated with functional status (r = -.23, p<.05) and social functioning (r = -.18, p<.05). Education had small but significant relationships with all KCCQ domains (r = .19, p<.05 to r = .32, p<.001), except for psychological status (r = .17, p>.05). Financial status and type of language were

positively correlated with KCCQ overall summary score (r = .18, p<.05 and r = .19, p<.05, respectively), functional status (r = .22, p<.05 and r =.27, p<.01, respectively), and social functioning (both r = .23, p<.05).

Relationships Between Health-Related Demographic Characteristics and HRQOL

As shown in Table 33, BMI was not correlated with any domains of the KCCQ. The scores for CCI-number and CCI-severity were significantly related to the KCCQ overall score, functional status, and psychological status (r = -.18 to r = -.23). Additionally, CCI-number had a low correlation with social functioning (r = -.19, p<.05). Except for the relationship with the domain of psychological status, the number of non-cardiovascular problems had significant associations with the remaining domains of the KCCQ (r = -.19, p<.05 to r = -.25, p<.01). In contrast, the number of cardiovascular diseases was not associated with KCCQ scores. After summing all cardiovascular and noncardiovascular problems together, concomitant health problems had only one relationship, which was a negative association with social functioning (r = -.19, p<.05). Furthermore, perceived health as measured by the modified SRHS was correlated with all KCCQ domains (r = .20, p<.05 to r =.33, p<.001), except for the domain of social functioning (r = .16, p>.05).

Table 33
Relationships Between Health-Related Demographic Characteristics and HRQOL

Variables		CCI		Concomitant Problems			
	BMI	Number	Severity	Total	CVD	Non-CVD	SRHS
KCCQ overall	-.04	-.23*	-.23*	-.12	.07	-.20*	.26**
Physical symptom	-.14	-.16	-.17	-.09	.12	-.21*	.20*
Functional status	-.004	-.22*	-.24**	-.13	.04	-.19*	.21*
Psychological status	-.13	-.19*	-.18*	.02	.07	-.03	.33***
Social functioning	.13	-.19*	-.17	-.19*	.02	-.25**	.16

*p< 0.05 level, **p<.01 level, ***p< 0.001 level (2-tailed).

Relationships Between Heart Failure Characteristics and HRQOL

Among the relationships with HF characteristics (see Table 34), the strongest

correlation was between NYHA Classification and HRQOL (r = -.43, p<.001 for psychological status to r = -.68, p< .001 for the KCCQ overall summary score). The type of HF had a significant association with the domain of social functioning; however, the relationship was small (r= .19, p<.05). Additionally, prescribed HF medication and duration since HF diagnosis did not relate to the KCCQ overall score or any domain score.

Table 34
Relationships Between HRQOL and Health-Related Demographic Characteristics

Variables	HF type	NYHA Class	HF medications	Duration since HF diagnosis
KCCQ overall	.12	-.68***	-.01	.02
Physical symptom	.03	-.58***	.06	.06
Functional status	.14	-.63***	-.02	-.06
Psychological status	.02	-.43***	.04	.09
Social functioning	.19*	-.60***	-.10	-.02

*p< 0.05 level, **p<.01 level, ***p< 0.001 level (2-tailed).

Relationships Between Sleep Variables and HRQOL

The relationships between sleep variables and HRQOL are shown in Table 35. Except for the prevalence of daytime napping and the KCCQ domain of physical symptom, all sleep variables showed low to moderate negative relationships with scores on the KCCQ overall score and all domain scores. The strongest correlation was between the KCCQ overall summary score and the global PSQI score (r=-.45, p<.001), and the weakest relationship was between the KCCQ domain of functional status and the PSQI component of use of sleeping medication (r = -.14, p>.05). The scores on global PSQI, subjective sleep quality, sleep efficiency, and sleep disturbances had significant correlations with all scores on the KCCQ (r = -.21, p<.05 to r = -.45, p<.001). Sleep duration was negatively correlated with the KCCQ overall summary score (r = -.22, p<.05), physical symptom (r = -.25, p<.01), and social functioning (r = -.21, p<.05), but not with functional status and psychological status. Sleep latency did not have a

relationship with psychological status (only r = -.05), whereas the use of sleeping medication was barely associated with psychological status (r = -.19, p<.05). The domain of daytime dysfunction was significantly related to all KCCQ scores (r= -.20, p<.05 to r = -.31, p<.001), except for domain of social functioning (r = -.15, p>.05).

Regarding daytime sleep, the ESS score had the same trend with daytime dysfunction. Pearson correlation coefficients for the relationships between ESS and HRQOL were from -.14 (p>.05) for social functioning to -.24 (p<.01) for both the KCCQ overall summary score and the domain of psychological status. The frequency of daytime napping was the only variable that correlated with social functioning (r = -.19, p<.05), indicating that the higher the score for frequency of daytime napping, the poorer the score for social functioning reported by Taiwanese persons with HF.

Table 35
Relationships Between Sleep Variables and HRQOL (n=125)

Variables		KCCQ overall	Physical symptom	Functional status	Psychological status	Social functioning	Symptom stability	Self-efficacy
Global PSQI		-.45***	-.41***	-.36***	-.28**	-.44***	-.21*	.03
Sleep quality		-.42***	-.38***	-.32***	-.29**	-.40***	-.15	.03
Sleep duration		-.22*	-.25**	-.13	-.15	-.21*	-.13	-.06
Sleep latency		-.27**	-.22*	-.28**	-.05	-.34**	-.22*	.06
Sleep efficiency		-.41***	-.33***	-.40***	-.21*	-.43***	-.14	-.06
Sleep disturbances		-.35***	-.40***	-.27**	-.22*	-.29**	-.08	.07
Daytime dysfunction		-.27**	-.31***	-.23**	-.20*	-.15	-1.70	-.01
Sleeping medication		-.14	-.08	-.02	-.19*	-.17	-.06	.11
CESS		-.24**	-.23*	-.19*	-.24**	-.14	-.12	-.23**
Daytime napping	Prevalence	-.06	.01	-.07	-.01	-.11	.10	-.10
	Frequency	-.15	-.07	-.13	-.08	-.19*	.16	.03
	Duration	-.13	-.16	-.10	-.10	-.08	1.12	-.01

* p< 0.05 level, ** p< 0.01 level, *** p< 0.001 level (2-tailed).

In summary, sixteen variables were correlated with the main variable HRQOL, as measured by the KCCQ overall summary score. They were age, education, financial status, type of language, NYHA classification, CCI-number, CCI-severity, chart-review concomitant noncardiovascular health problems, perceived health, subjective sleep quality, sleep duration, sleep latency, sleep efficiency, sleep disturbances, daytime dysfunction, and

daytime sleepiness. Pearson correlation coefficients ranged from .18 (financial status) to .68 (NYHA Classification). A summary of the correlates of HRQOL is shown in Table 36. According to the results from the analyses of HRQOL and demographic data, participants who were younger, had higher educational levels and better financial status, and those who could speak both Taiwanese and Mandarin reported better HRQOL. From the analyses of HRQOL and HF characteristics, the results showed that participants with lower levels of NYHA Classes perceived a better HRQOL. In regard to the relationships between HRQOL and health-related characteristics, participants who were living with smaller numbers of comorbid conditions and with less severe comorbidity as measured by CCI and participants with a smaller number of concomitant noncardiovascular problems and better health perceptions experienced better HRQOL. According to the findings from the analyses of HRQOL and sleep variables, Taiwanese persons who had higher subjective sleep quality, longer sleep durations, less sleep latency, better sleep efficiency, fewer sleep disturbances, and lower levels of daytime sleepiness reported better HRQOL.

Table 36
Correlates of HRQOL (*n*=125)

Variable	HRQOL
NYHA Class	-.68***
Subjective sleep quality	-.42***
Sleep efficiency	-.41***
Sleep disturbances	-.35***
Education	.30**
Sleep latency	-.27**
Daytime dysfunction	-.27**
SRHS	.26***
CESS	-.24**
CCI-number	-.23*
CCI-severity[1]	-.23*
Sleep duration	-.22*
Age	-.20*
Concomitant Problems- non-CVD	-.20*
Language	.19*
Financial status[1]	.18*

*p< 0.05 level, **p<.01 level, ***p< 0.001 level (2-tailed).
[1]Eliminated from the multiple regression analysis.

Question 4. *What are the predictors of HRQOL among Taiwanese people with HF?*

As described in Question 3, 16 predictor variables showed correlations with HRQOL as measured by the KCCQ overall summary score. Before initiating the multiple regression analysis to identify the predictors of HRQOL in Taiwanese persons with HF, certain assumptions of a multiple regression analysis were examined for the data to ensure that the findings from the analyses could be generalized to the general population. The assumption of normality was supported by an analysis of a stem-and-leaf chart and histogram of the Studentized residual (Norusis, 2004). The Kolmogorov-Smirnov statistic for the residual model was .07 ($p>.05$) (Munro, 2001). Likewise, a Q-Q plot showed that the Studentized residuals fell close to a straight line, indicating that the sample was drawn from a normal distribution (Norusis, 2004). The assumption of independence was met according to a Durbin-Watson statistic of 2.28 (within a range of 1.5 to 2.5) (Norusis, 2004). The linearity assumption was supported by a linear relationship between the Studentized residuals and the KCCQ overall summary score. Furthermore, the plots of the Studentized residuals and predicted values showed that the residuals were randomly scattered along a horizontal line through zero, indicating that the homoscedasticity assumption was met (Norusis, 2004).

Multicollinearity, however, should be considered a problem because two pairs of variables each showed high and moderate correlations: CCI-number vs. CCI-severity ($r = .95$, $p<.001$) and education vs. type of language ($r = .58$, $p<.001$). An initial regression analysis with all variables was therefore performed to obtain collinearity diagnostics (Hutcheson & Sofroniou, 1999). The results showed that CCI-number and CCI-severity had similar data for tolerance (.08 for each) and VIF (12.51 for CCI-number vs. 13.03 for CCI-severity). CCI-number, however, had a higher unstandardized coefficient ($B = -4.70$) and standardized coefficient (*Beta* = -.30) than CCI-severity ($B = 2.03$, *Beta* = .19). It was

decided to exclude CCI-severity and to retain CCI-number. Similarly, education was moderately correlated with type of language (r = .68, p<.001). The tolerance and VIF for education were .45 and 2.12, respectively, and for type of language they were .43 and 2.30, respectively. Education had a higher unstandardized coefficient (B = 1.16) and a standardized coefficient (*Beta* = .10) than type of language (B = -0.75, *Beta* = -.04). Therefore, the variable of type of language was eliminated from the regression model. As a result, fourteen variables were included in the regression model, and the Pearson correlation coefficients among the final predictor variables ranged from -.01 to .69, tolerance was from .47 to .88, and VIF was from 1.14 to 3.82.

Hierarchical Multiple Regression Analysis

Variables entered into the regression model were based on the conceptual model of this study. The fourteen variables were available to enter in three steps using a hierarchical multiple regression analysis with forward method. A total of six models were generated in the three steps. The R^2 for the final model was .585 (p<.001), with an adjusted R^2 of .564.

Age, education, and financial status were available to enter in the first step as covariates. Education was the only significant predictor among these three predictor variables of HRQOL, accounting for 9.0% of the variance (p<.01). Those who had higher education levels had better HRQOL.

CCI-number, noncardiovascular concomitant problem, perceived health, and NHYA Class were available to enter in the second step as covariates. Two significant predictors were identified from these four variables. When NYHA Class was added to the second model, the R-square (R^2) increased by .398 (p<.001), from .09 to .488. When CCI-number was added to the third model, it accounted for an additional 2.6% of the variance (p<.05) and 51.4% of the variance associated with education and NYHA Class.

NYHA Class and CCI-number collectively accounted for 42.4% of the variance in HRQOL. Participants with HF who had lower NYHA Classes and a small number of comorbid conditions reported higher HRQOL.

In the third step, six components of nocturnal sleep quality (subjective sleep quality, sleep duration, sleep latency, sleep efficiency, sleep disturbances, and sleep dysfunction) and daytime sleepiness were available to enter. The results showed that after controlling for education, comorbidity, and NYHA Class, subjective sleep quality, sleep disturbances, and sleep latency were identified as significant predictors and accounted for 7.0% of the variance in HRQOL. Subjective sleep quality, when entered into Model 4, accounted for 3.7% of the variance in HRQOL (p<.001), resulting an increased R^2, from .514 to .551. When sleep disturbances was added to Model 4 to obtain Model 5, the percentage of the variance increased by 1.5% (p<.05), from 55.1% to 56.7%. The addition of sleep latency to Model 5 to obtain Model 6 explained an additional 1.8% of the variance (p<.05). The findings indicated that those who had fewer sleep disturbances, better subjective sleep quality, and shorter sleep latency experienced better HRQOL. In contrast, sleep efficiency, sleep duration, daytime dysfunction, and daytime sleepiness did not show significant contributions to HRQOL. The summary for the hierarchical multiple regression of predictor variables on HRQOL is shown in Table 37.

Table 37
Hierarchical Multiple Regression of Predictor Variables on HRQOL (n=125)

Model	Predictors	B	B SE	Beta	df	F	R^2	Adjusted R^2	R^2 Change
Step 1									
1	(Constant)	60.33	3.37		1, 123	12.11**	.090	.082	
	Education	3.46	1.00	.30**					.090**
Step 2									
2	(Constant)	119.00	6.53		2, 122	58.14***	.488	.480	
	Education	2.10	.76	.18**					
	NYHA Classes	-24.32	2.50	-.64***					.398***
3	(Constant)	121.84	6.49		3, 121	42.70***	.514	.502	
	Education	2.18	.75	.19**					
	NYHA Classes	-23.57	2.46	-.62***					

Table 37 (Continued)

Model	Predictors	B	B SE	Beta	df	F	R^2	Adjusted R^2	R^2 Change
	CCI-number	2.56	1.00	-.16***					.026*
Step 3									
4	(Constant)	124.66	6.32		4, 120	36.88***	.551	.537	
	Education	1.85	.73	.16*					
	NYHA Classes	-21.80	2.44	-.58***					
	CCI-number	-1.97	.98	-.13*					
	Sleep quality	-4.43	1.41	-.21**					.037**
5	(Constant)	128.67	6.54		5, 119	31.12***	.567	.548	
	Education	1.80	.72	.16*					
	NYHA Classes	-21.38	2.42	-.57***					
	CCI-number	-1.98	.97	-.13*					
	Sleep quality	-3.17	1.52	-.15*					
	Sleep disturbance	-4.62	2.26	-.14*					.015*
6	(Constant)	130.05	6.46		6, 118	27.69***	.585	.564	
	Education	1.87	.71	.16**					
	NYHA Classes	-22.50	2.42	-.59***					
	CCI-number	-2.03	.95	-.13*					
	Sleep quality	-4.57	1.62	-.21**					
	Sleep disturbance	-5.96	2.30	-.18*					
	Sleep latency	2.99	1.32	.17*					.018*

Note. Analyzed by the forward method.
F for final equation = 27.69 with 6/118 degree freedom (df), p<.001.
*p< 0.05 level, **p<.01 level, ***p< 0.001 level (2-tailed).

Additional Analyses

Predictors of Nocturnal Sleep Quality

The study found that ten variables were correlated with the global PSQI score, as shown in Table 38. The participants who experienced poor sleep quality were female; had lower educational levels and higher NYHA Classes; higher numbers for comorbidity and perceived poor health; and reported poor physical symptom, symptom stability, functional status, psychological status, and social functioning.

Table 38
Correlates of Global PSQI Score (n=125)

Variables	Global PSQI
Social functioning	-.44***
Physical symptom	-.41***
Functional status	-.36***
NYHA Class	.35***
Psychological status	-.28**
Perceived health	-.27***

Symptom stability	-.21**
CCI-number	.20*
Education	-.19*
Gender	-.18*

*p< 0.05 level, **p<.01 level, ***p< 0.001 level (2-tailed).

A three-step hierarchical multiple regression analysis with forward method was then employed to identify predictors of nocturnal sleep quality, as measured by the global PSQI. Before the analysis proceeded, assumptions of the multiple regression analysis were examined, and the data met the criteria. Variables entered into the regression model were based on the conceptual model of this study. The ten variables were available to enter on three steps. Gender and education were available to enter in the first step as covariates. Education, which was the only significant predictor in this step, accounted for 3.4% of the variance (p<.05). Those who had higher educational levels reported better nocturnal sleep quality. The NYHA Class, CCI-number, and perceived health were available to enter in the second step. Two significant predictors were identified from these three variables. When NYHA Class was added to the Model 2, it accounted for an additional 10% of the variance in nocturnal sleep quality (p<.001). When perceived health was added into the third model, R^2 was increased by .037 (p<.05), from .134 to .171. When five KCCQ domains were available to enter into the third step, only social functioning and physical symptom were significant predictors of nocturnal sleep quality among the six predictor variables. Social functioning, when added to generate Model 4, accounted for an additional 6.9% of the variance (p<.01), and physical symptom was added for a Model 5, which increased the variance by 2.9%, from 24.0% to 26.9%. The summary for the hierarchical multiple regression of predictor variables on nocturnal sleep quality is shown in Table 39.

Overall, the total variance explained by the final model was 26.9%. After controlling for education, NYHA Class, and perceived health, the analysis showed that

two variables—social functioning, and physical symptom—accounted for 9.8% of the variance in nocturnal sleep quality. Participants who experienced better social functioning and fewer physical symptoms reported better nocturnal sleep quality. In contrast, the overall HRQOL, functional status, and psychological status were not predictors of nocturnal sleep quality.

Table 39
Hierarchical Multiple Regression of Predictor Variables on Nocturnal Sleep Quality (n=125)

Model	Predictors	B	B SE	Beta	df	F	R^2	Adjusted R^2	R^2 Change
Step 1									
1	(Constant)	10.54	.82		1, 123	4.34*	.034	.026	
	Education	-.51	.24	-.19*					.034*
Step 2									
2	(Constant)	3.58	2.01		2, 122	9.47***	.134	.120	
	Education	-.34	.23	-.13					
	NYHA Classes	2.89	.77	.32***					.10***
3	(Constant)	6.89	2.43		3, 121	8.34***	.171	.151	
	Education	-.27	.23	-.10					
	NYHA Classes	2.56	.77	.29**					
	Perceived health	-.86	.37	-.20*					.037*
Step 3									
4	(Constant)	14.43	3.28		4, 120	9.47***	.240	.215	
	Education	-.07	.23	-.03					
	NYHA Classes	.88	.90	.10					
	Perceived health	-.85	.36	-.20*					
	Social functioning	-.06	.02	-.34**					.069**
5	(Constant)	18.65	3.77		5, 119	8.74***	.269	.238	
	Education	-.06	.23	-.02					
	NYHA Classes	.10	.96	.01					
	Perceived health	-.78	.35	-.18*					
	Social functioning	-.05	.02	-.28*					
	Physical symptom	-.05	.02	-.22*					.029*

• Analyzed by the forward method
F for final equation = 8.74 with 5/119 degree freedom (df), p<.001.
*p< 0.05 level, **p<.01 level, ***p< 0.001 level (2-tailed).

Predictors of Daytime Sleepiness

Seven variables showed small but significant correlations with daytime sleepiness as measured by ESS. Those who had higher level of daytime dysfunction, greater BMI, and poor perceptions of health, psychological status, self-efficacy, physical symptom, and

functional status experienced higher daytime sleepiness. The summary of correlates of daytime sleepiness is given in Table 40.

Table 40
Correlates of Daytime Sleepiness (n=125)

	Daytime sleepiness
PSQI Daytime dysfunction	.32**
Psychological status	-.24**
Self-efficacy	-.23**
Physical symptom	-.23*
BMI	.20*
Perceived health	-.19*
Functional status	-.19*

*p< 0.05 level, **p<.01 level (2-tailed).

A multiple regression analysis with forward method was run with the seven variables. Three variables were identified as significant predictors among these seven variables, and together they accounted for 18.7% of the variance in daytime sleepiness. The PSQI daytime dysfunction was first generated for the model, and it explained 10% of the variance in daytime sleepiness (p<.001). When self-efficacy was added to the second model, R^2 increased by .054 (p<.01), from .10 to .154. When BMI was entered the third model, R^2 increased by .031, from .154 to .187. The results indicated that the Taiwanese participants with HF who reported lower level of daytime dysfunction, better self-efficacy, and lower BMI levels had lower tendencies to fall asleep or doze off in the daytime. The summary for predictors of daytime sleepiness is given in Table 41.

Table 41
Multiple Regression of Predictor Variables on Daytime Sleepiness (n=125)

Model	Predictors	B	B SE	Beta	df	F	R^2	Adjusted R^2	R^2 Change
1	(Constant)	5.89	.53		1, 123	13.69***	.100	.093	
	Daytime dysfunction	1.55	.42	.32***					.100***
2	(Constant)	9.20	1.29		2, 122	11.10***	.154	.140	
	Daytime dysfunction	1.54	.41	.32***					
	Self-efficacy	-.04	.02	-.23**					.054**
3	(Constant)	3.86	2.73		3, 121	9.26***	.187	.167	
	Daytime dysfunction	1.47	.40	.30***					
	Self-efficacy	-.04	.02	-.23**					.033*

BMI	.21	.10	.18*

• Analyzed by the forward method
F for final equation = 9.26 with 3/121 degree freedom (df), p<.001.
*p< 0.05 level, **p<.01 level, ***p< 0.001 level (2-tailed).

Summary

This chapter has described the findings from the data analysis. A total of 125 participants were enrolled in this study. The mean age of the participants was 67.79 (*SD* = 12.19). The majority of the participants were male (55.2%), married (70.4%), living with families (88%), literate (69.6%), unemployed or retired (68%), Taiwanese-speaking (52.0%), and reported adequate financial status (79.2%). Forty percent of the participants had systolic HF, and another 40.8% had diastolic dysfunction. The majority (72.0%) was in NYHA Class II. The mean number of prescribed HF medications used was 3.58 (*SD* = 1.51), a mean duration since their HF diagnoses of 35.66 months (*SD* = 43.81), and a mean BMI of 25.55 kg/m^2 (*SD* = 4.37). The average Charlson comorbidity severity score was 2.39 (*SD* = 1.88), and the mean comorbidity number was 1.86 (*SD* = 1.25). The mean chart-review concomitant health problem was 4.88 (*SD* = 1.83), which included both cardiovascular problems (mean = 3.05, *SD* = 1.16) and noncardiovascular problems (mean = 1.83, *SD* = 1.46). The top three cardiovascular concomitant problems were hypertension (65.6%), valvular heart disease (56.0%), and coronary artery disease (44%). Likewise, the mean SHRS score was 3.26 (*SD* = 1.07).

The global PSQI scores of the 125 participants ranged from 0 to 20, with a mean of 9.06, and 93 (74.4%) of the participants were identified as poor sleepers (PSQI>5). The ESS scores ranged from 0 to 22, with a mean score of 6.99 (*SD* = 5.07). Thirty (24%) of the participants reported excessive daytime sleepiness (ESS> 10). Likewise, 102 (81.6%) participants reported that they engaged in habitual daytime napping after lunch, with 62.4% taking daytime naps everyday. The mean duration of daytime napping for the 102 participants was 82.3 (*SD* = 50.42) minutes.

The mean KCCQ overall summary score for the 125 participants was 70.50 (*SD* = 19.63), with a range from 11.98 to 95.83. The physical symptom domain had the highest score (mean = 73.98, *SD* = 21.31), and psychological status was the lowest (mean = 65.60, *SD* = 24.72). Pearson correlation analyses showed that the correlates of HRQOL included age, education, financial status, language, NYHA Class, comorbidity, health perception, subjective sleep quality, sleep duration, sleep latency, sleep efficiency, sleep disturbances, and daytime sleepiness.

A three-step hierarchical multiple regression analysis was used to analyze significant predictors of HRQOL as measured by the KCCQ overall summary score. Six predictors were identified from 14 predictor variables, and those six accounted for 58.5% ($p<.001$) of the variance in HRQOL. After controlling for education, comorbidity, and NYHA Class, the analyses showed that three sleep variables (subjective sleep quality, sleep disturbances, and sleep latency) accounted for 7% of the variance in HRQOL. The study found that the Taiwanese persons with HF who experienced better HRQOL were those who had higher levels of education, lower NYHA Classes, and smaller numbers of comorbid conditions, and reported better subjective sleep quality, fewer sleep disturbances, and shorter sleep latency.

Chapter 5: Summary, Implications, and Recommendations

In this chapter, a summary of the study is presented as well as a discussion of issues related to the sample, the findings, and the methodology. In addition, the chapter includes the implications of the findings and provides recommendations for future research. A few closing remarks are provided at the end of the chapter.

Summary of the Study

The goals of this cross-sectional, descriptive, correlational study were to describe the characteristics of sleep disorders and HRQOL; to explore the relationships between individual characteristics, HF characteristics, sleep disorders, and HRQOL; and to identify predictors of HRQOL. A conceptual model that incorporated HRQOL and sleep disorders provided a guide for the study. A nonprobability sample of 125 participants with HF was recruited from the outpatient departments of a large medical center and an affiliated hospital located in southern Taiwan. Inclusion criteria for participants were as follows: (1) diagnosed with HF of any NYHA Functional Class (Classes I, II, III, or IV) (The Criteria Committee of the AHA, 1994) by physicians, (2) aged 18 years or older, (3) community-dwelling, (4) able to communicate either by speaking Mandarin or Taiwanese or by writing Mandarin (the official Chinese language), and (5) willing to participate in this study. All participants were individually interviewed by the principal investigator in either a private area within a clinic or in their homes, except for two participants who completed the questionnaires by themselves at locations of their choice. The period for data collection was approximately four months, from October 2006 to January 2007.

Seven instruments were used for the research study. They included (1) a demographic questionnaire eliciting individual characteristics and HF characteristics; (2) the Charlson Comorbidity Index and a chart-review list of ten major concomitant health problems for measuring comorbidities; (3) the modified Self-Rated Health Subscale for

measuring perceived health; (4) the Kansas City Cardiomyopathy Questionnaire (KCCQ) for measuring HRQOL; and (5) two questionnaires about sleep disturbances, namely, the Pittsburgh Sleep Quality Index and the Epworth Sleepiness Scale. The completion time for the instruments was 20 to 60 minutes. The data, which included concomitant health problems and HF characteristics, were collected from the hospital medical records after receiving the participants' permission. Each participant's NYHA Class was assessed by a senior cardiologist who was blind to the KCCQ scores reported by the participants. Data were analyzed by using the SPSS Version 14.0 for Windows. The individual and HF characteristics and the major variables were analyzed with descriptive statistical techniques. Pearson correlations were used to determine correlates of HRQOL, and predictors of HRQOL were identified by using a hierarchical multiple regression analysis. Before the data analysis, checks were made for normality and normal distribution of the major variables and assumptions of the multiple regression analysis for predictor variables of HRQOL. Two variables, language and CCI severity, were eliminated from the regression analysis because of multicollinearity considerations.

Overall, the study findings indicated that insomnia (difficulty initiating sleep, maintaining sleep, or both) may be common among the participants. Approximately 72.8% of the participants reported poor nocturnal sleep quality. The mean sleep duration was 5.6 hours with a mean sleep latency of 46.3 minutes, and the mean habitual sleep efficiency was 73%. The domain of sleep efficiency presented the strongest relationship with nocturnal sleep quality (r = .84, p<.001), whereas daytime dysfunction was the weakest (r = .33, p<.001). The three most frequent events regarding sleep disturbances were "to have to get up to use the bathroom" at least one to three or more times a week (83.2%), "cannot get to sleep within 30 minutes" (62.4%), and "wake up at midnight or early morning" (56.0%).

In contrast, daytime sleepiness did not physically influence the participants with HF. Only 30 (24%) of them reported excessive daytime sleepiness. The top three situations causing daytime sleepiness within this sample were "lying down to rest in the afternoon," "watching TV," and "sitting quietly after a lunch without alcohol." Additionally, the majority (81.6%) of the participants reported they were prone to habitual daytime napping after lunch. Except for the significant relationship between daytime sleepiness and the component of daytime dysfunction (r= .33, p<.001), daytime sleepiness and daytime napping were not significantly correlated with the global and componential variables of nocturnal sleep quality.

The mean KCCQ overall summary score for HRQOL in this sample was 70.50 (SD = 19.63). HRQOL physical symptom had the highest score, and the psychological status domain was the lowest. Of the participants, 24.8% reported swelling feet, ankles, or legs; 69.6% reported fatigue; 68% reported SOB, and 24% reported sitting in a chair or using more pillows for sleep. The most difficult daily activities performed by the participants were "hurrying or jogging" (92.8%), "doing yard work or housework and carrying groceries" (66.4%), and "climbing a flight of stairs without stopping" (60.0%). Over 84% of the participants reported slight to complete dissatisfaction with living with HF. They reported feelings of discouragement (50.4%) and slight to extreme restrictions on enjoying their life, taking part in hobbies and recreational activities (64%), working or doing household chores (83.2%), and visiting family or friends (50.4%).

Sixteen predictor variables showed correlations with HRQOL. Pearson's correlation coefficients ranged from .18 (financial status) to .68 (NYHA class). According to the results from the analyses of HRQOL and demographic data, age, education, financial status, and type of language were significantly associated with HRQOL, but not gender, marital status, and living arrangement. From the analyses of HRQOL and HF

characteristics, the results showed that NYHA class was highly correlated with HRQOL; however, type of HF, prescribed HF medication, and duration since the HF diagnosis were not correlates of HRQOL. In regard to the relationships between HRQOL and health-related characteristics, CCI-number, CCI-severity, concomitant noncardiovascular problems, and perceived health had significant relationships with HRQOL, whereas BMI did not. According to the findings from the analyses of HRQOL and sleep variables, except for the use of sleeping medication and daytime napping, all components of nocturnal sleep quality and daytime sleepiness were significantly related to HRQOL in a negative direction.

Six predictors of HRQOL were identified from its 14 correlates by using a three-step hierarchical multiple regression analysis. Individual characteristics (age, education, and financial status) were first available to enter into the model, then NYHA Classification, CCI-number, chart-review non-cardiovascular concomitant problems, and modified SRHS, and finally sleep variables (daytime sleepiness and all components of nocturnal sleep quality except for the use of sleeping medication). Those predictors were education (9%), NYHA class (39.8%), CCI-number (2.6%), subjective sleep quality (3.7%), sleep disturbances (1.5%), and sleep latency (1.8%), and together they accounted for a total of 58.5% of the variance in HRQOL. Overall, Taiwanese persons with HF who experienced better HRQOL were those who had higher levels of education, lower NYHA Classes, and smaller numbers of comorbidity conditions and who reported better subjective sleep quality, fewer sleep disturbances, and shorter sleep latency. Correlates of HRQOL that did not act as predictors of HRQOL included age, financial status, concomitant noncardiovascular problems, perceived health, sleep efficiency, sleep duration, daytime dysfunction, and daytime sleepiness.

Discussion of Findings

Issues Related to Demographics

The participants lived primarily in four large cities and counties—Tainan City, Tainan County, Kaohsiung County, and Chiyi City—distributed over approximately 30 townships in southern Taiwan. Consequently, a large proportion of the participants lived in rural areas. Tsai, Chi, Lee, and Chou (2004) found that elderly people living in rural communities had poorer HRQOL, as measured by the SF-36, when compared to Taiwanese older adults living in urban and remote island communities. Therefore, geographic areas should be taken into account when one interprets the findings of this study. In addition, this study found that several participants who lived in rural areas had to spend one hour or more traveling to their hospitals. Some of those participants had to rely on their families to drive them to the hospital because public transportation was inconvenient and they could not ride a motorcycle or drive a car for the visits. Participants who did not have families usually made round trips to and from the hospitals in cabs (in which cases the drivers waited while the participants were seen by doctors), and the fares for the cabs were usually equal to or higher than their medical fees. As a result, a small number of participants visited their physicians only intermittently and therefore did not take medications regularly, particularly if they thought their symptoms were under control. Such participants usually revisited the clinics only when their symptoms recurred.

Over 63.2% of the participants in this study were older than 65 years. As shown in Table 9, the trend in the distribution of HF for different ages supports the view that the prevalence of HF increases with age (Hunt et al., 2005). Overall, the study sample was older (67.79 ± 12.19 years old, n = 125) than those in the Wang (2005) study (65.75 ± 14.19 years old, n = 80) and the Cheng (2004) study (60.70 ± 10.61 years old, n = 100), younger than that in the Yu et al. (2004) study (77.1 ± 7.9 years, n = 227), but similar to those in the Shan (2002) study (66.10 ± 13.78 for the interventional group [n = 10] and

67.45 ± 10.13 years old for the control group [n = 10]). Furthermore, participants of older ages tended to be Taiwanese speaking (r = -.46, p<.001) and were characterized by lower levels of education (r = -.27, p<.01), unemployment or retirement (r = .33, p<.001), and lower BMIs (r = -.30, p<.01).

In terms of gender, educational level, employment status, marital status, and living arrangement, the participants had demographic characteristics similar to those in previous studies addressing Taiwanese HF participants living in northern Taiwan (Chen, 2004; Cheng, 2004; Wang, 2005). Additionally, it is important to note that several participants appeared to be of a low social class (low income, low literacy, and unemployment). Of the sample, 30.4% were illiterate, 44% were unemployed, and 21% reported poor economic status. As noted previously, the majority of the participants were living in rural areas, and 52% could speak Taiwanese only.

Issues Related to Heart Failure Characteristics

The prevalence of diastolic and systolic HF in this sample was approximately 40% for each. A third type, valvular dysfunction, was also identified as HF because it was difficult to differentiate that type from either diastolic or systolic HF (Patel & Konstam, 2001). When the criterion of LVEF greater than 50% was used to include the number with valvular dysfunction (19.2%) into the count of those with diastolic HF, however, the incidence of diastolic HF increased to 60%. Overall, the prevalence of HF was similar to that found in the literature (Banerjee, Banerjee, Khand, Clark, & Cleland, 2002; Bursi et al., 2006; Wu & Yu, 2005).

An issue of concern in this study was that the use of the criterion setting the LVEF at less than or greater than 50% (Hunt et al., 2005) to classify HF into systolic or diastolic HF may be problematic. The current study found that several participants whose cardiac echo tests showed normal LVEF had contractile abnormalities. That finding echoes a

recent argument that the categorization of HF into two distinct types based simply on LVEF is arbitrary and causes selection bias in HF studies (De Keulenaer & Brutsaert, 2007; Fukuta & Little, 2007; Shammas, Khan, Nekkanti, & Movahed, 2007). A study of 556 community residents found that LVEF and diastolic dysfunction were two independent factors having associations with higher levels of B-type natriuretic peptide (Bursi et al., 2006). Diastolic dysfunction is not unique to HF with preserved ejection fraction, whereas systolic dysfunction is not specific for HF with reduced LVEF (De Keulenaer & Brutsaert, 2007). Further research is needed into the use of preserved, normal, or reduced LVEF as a distinguishing factor.

Another important issue is that several participants in this study did not present with typical features (both symptoms and results from cardiac echo tests) specific to either systolic or diastolic dysfunction. Some participants with diastolic HF of NYHA Class III presented with more severe HF symptoms, such as shortness of breath and activity intolerance, and reduced functioning than those with systolic dysfunction, whereas those with systolic HF represented a larger number of NYHA Classes III and IV (see Table 42). This might result in non-significant findings about differences in the HRQOL domains among the types of HF (see Table 43). Those findings, however, are different from those in previous studies showing that HRQOL varied for different diastolic and systolic groups (Jaarsma et al., 1999; Kitzman et al., 2002; Wu & Yu, 2005).

Table 42
Association Between Type of HF and NYHA Classification

	NYHA Classification				Total
	I	II	III	IV	
Systolic	2	26	20	2	50
Diastolic	0	44	7	0	51
Valvular	1	20	3	0	24
Total	3	90	30	2	125

▪ Pearson Chi-Square = 18.62, $df = 6$, $p < .01$

In conclusion, because different types of HF may have different underlying

conditions and precipitating factors, more precise definitions of the types of HF are imperative. Such definitions would help healthcare providers select more accurate treatments for HF, that is, treatments that specifically target underlying conditions and precipitating factors (Nieminen et al., 2006).

Table 43
Differences in HRQOL Among Types of Heart Failure

	Systolic HF	Diastolic HF	Valvular HF	F
Overall HRQOL	69.18 (23.44)	68.95 (15.78)	76.52 (17.88)	1.41
Physical symptom	75.04 (24.83)	70.67 (19.31)	78.82 (16.52)	1.30
Symptom frequency	68.58 (27.84)	61.77 (24.53)	73.26 (19.86)	1.94
Symptom Burden	81.50 (26.10)	79.58 (18.95)	84.38 (18.28)	.39
Symptom stability	52.50 (22.16)	51.47 (16.89)	52.08 (20.74)	.03
Functional status	70.32 (28.13)	72.75 (19.41)	79.86 (21.41)	1.33
Psychological status	67.33 (26.77)	61.44 (23.09)	70.83 (23.31)	1.39
Social functioning	64.04 (28.17)	70.96 (22.35)	76.56 (22.21)	2.26
Self-Efficacy	79.00 (26.30)	72.55 (31.13)	85.94 (20.63)	2.03

Approximately 72% of the participants had NYHA Class II HF, which was lower than those of samples in previous studies, which had higher percentages of NYHA Class III (Cheng, 2004; Ho et al., 2004; Wang, 2005; Wang, 2003). There were two reasons for the lack of sufficient participants with HF of Class I, III, and IV in this study. (1) The clinics did not have many participants with Class I HF during the data-collection phase. Indeed, it was not easy to diagnose Class I HF because patients in that group usually do not have marked symptoms (Hunt et al., 2005). Such persons seek medical help only when they have HF of NYHA Class II or higher. (2) Several participants with Class III and IV HF were unable to make clinic visits because of the severity of their symptoms. They usually visited emergency rooms or were hospitalized when symptoms occurred. Several of those patients who could not make the clinical visits asked their families to help them refill their prescribed medications during their monthly or regular clinic visits.

The mean number of HF medications used was 3.58 (*SD* 1.51), which was similar to that in the Cheng (2004) study (3.91±1.61). However, the participants in the current

study received a greater number of beta blockers (28.0% vs. 17%) and calcium channel blockers (39.2% vs. 30%) but fewer angiotensin-receptor blockers (43.2% vs. 56%) and digitalis (26.4% vs. 78%) than those in the Cheng (2004) study. The use of vasodilators (62.4%) was higher than that reported in the Riedinger et al. (2000) study with American patients (52.82%). The use of HF medication might vary among the different hospitals and cardiologists (Luthi et al., 2006).

Regarding the time since the patient was diagnosed with HF, approximately 28% of the participants received the diagnosis within the previous 1 to 6 months. The actual duration for this sample could be even longer. Several participants could not remember the date that they received their HF diagnosis. Some stated that they were informed they had declined in heart function but not HF, thus, they had difficulty answering this question. Those participants generally asked the principal investigator to find the answer from their medical records, however, a small number of the participants had been treated in other hospitals for several years before visiting the cardiologists in the two hospitals of this study. The precise duration for their HF diagnosis, therefore, might be not reliable. Overall, the mean time since HF diagnosis (2.97±3.65 years) in this study was less than that in the Cheng (2004) study (3.59±2.3 years), but it was similar to that in the Yu et al. (2004) study (3.0±2.64 years).

Issues Related to Health-Related Characteristics

Obesity was prevalent among the participants. Approximately 21% of the participants were overweight, and 38.4% had mild to severe obesity. The BMI decreased with age (r = -.30, p<.01), which was similar to the findings of Huang, Pan, Lee, and Chang (2006). BMI had a positive direction with dyslipidemia; that is, participants with greater BMI were more likely to be those who had dyslipidemia (r = .18, p<.05).

Several issues are related to comorbidity. Overall, the use of both self-reported

and chart-review methods combined with the use of structured check-list forms provided more detailed and valuable information about comorbidity. The CCI-number and CCI-severity were correlated with chart-review total concomitant health problems and noncardiovascular problems (r = .38 to r = .40, all p<.001). However, to prevent pre-existing multicollinearity between CCI and HRQOL, the principal investigator excluded the comorbid condition HF from the scoring of the self-reported CCI. National guidelines in the U.S. promoted by ACC/AHA recommend these same standard data set variables be collected in HF research studies for comparisons across studies (Radford et al., 2005).

The findings about comorbidity indicated that the participants experienced a high burden of illness. The study showed a higher score for CCI-severity (2.39±1.88) than that in the Riedinger et al. (2000) study (0.98±.70), but lower than those in the De Jong et al. (2005) and Clark et al. studies (3.63 and 3.7, respectively). The mean number of comorbid conditions (1.86) measured by CCI was similar to those in the Cheng (2004), Yu et al. (2004), and Friedman (2003) studies; however, the study showed higher concomitant health problems (4.88) measured with the chart-review approach than did the previous studies.

Hypertension was the most frequent underlying disease in the sample (65.6%), which was similar to the findings of several studies conducted in the U.S., Europe, Taiwan, and Hong Kung (De Jong et al., 2005; Nieminen et al., 2006; Subramanian et al., 2005; Wang, 2005; Yu et al., 2004). In contrast, a history of coronary artery disease or previous myocardial infarction was most commonly found in the Wang (2003), Riedinger et al. (2000), and Heo et al. (2005) studies (57.1% [n = 60/105], 61.22% [n = 423/691], and 53% [n = 155/293], respectively) and was also highly prevalent in the De Jong et al. (2005) and Subramanian et al. (2005) samples (70% [n = 61/87] and 82.1% [n = 135/165],

respectively). Generally, the proportion of coronary artery disease in those studies tended to be higher than those addressing samples from the Taiwanese population. Additionally, over 56% of the participants had valvular disorders, particularly mitral regurgitation, followed by tricuspid regurgitation. Of those participants with valve problems, 54.3% reported arrhythmia, and several expressed worries about the negative effects of the valvular disorders on heart function. The findings suggested that the valve dysfunction may diminish the therapeutic effects for HF and cause more physical and psychological discomfort for the participants (Nieminen et al., 2006).

Participants who were older, had lower financial status, and had HF of higher NYHA Functional Classifications reported greater numbers of concomitant noncardiovascular problems (r = .21, -.22, .18, respectively, all p<.05). Notably, musculoskeletal problems were the most frequent concomitant health problem among the participants (36.8%). The reason for that high frequency might be that the majority of the participants were elderly, farmers, and blue-collar workers. Such individuals are more likely to experience diminutions of musculoskeletal function, such as osteoporosis, spondylosis, and osteoarthritis. Musculoskeletal problems, however, did not significantly correlate with any demographics and major variables of this current study.

Diabetes affected one-third of the participants in this study, similar to that found in previous HF studies conducted in different cultures (Cheng, 2004; Heo et al., 2005; Nieminen et al., 2006; Wang, 2003). In contrast, Subramanian et al. (2005) found a higher proportion of diabetes (75%) in their study. In the current study, however, diabetes did not show relationships with any demographics and major variables.

The finding that chronic renal insufficiency affected 17 participants was found with the chart-review approach. Participants with chronic renal insufficiency were more likely to be those having HF of higher NYHA classifications (r = .26, p<.01). Research

has found that patients with decompensated HF usually are resistant to diuretics and have to be treated with higher doses to reduce salt and water (Francis, 2006). In the long-term, however, treatment with diuretics may decrease renal function. Moreover, research has found that worsening renal function is correlated with higher levels of preventable hospitalization and in-hospital mortality in patients with HF (Braunstein et al., 2003; Chen et al., 2003). Likewise, in the current study, chronic renal insufficiency was correlated with worsening HRQOL, including functional status (r = -. 19, p<.05), social functioning (r = -.22, p<.05), and the KCCQ overall summary score (r = -.19, p<.05). Overall, chronic renal insufficiency may have significant adverse effects on both HRQOL and HF mortality. Those effects can increase the difficulty in treating HF and result in poor HRQOL for people with HF.

In regard to perceived health, the study found that participants answered the four items of the SRHS in different ways, resulting in low inter-correlations among the items. As shown in Table 44, of the participants who rated their health as poor, 15 perceived their health problems did not affect their ability to do the things they wanted to do, and 2 viewed their health as better than that of others their age. For the three participants who ranked their health as good, two reported that their health predominantly hindered them from doing the things they wanted. Similarly, the only participant who rated his health as excellent and who reported his health as better than that of others his age answered that he perceived great limitations in doing the things he wanted to do. That 79-year-old participant stated that, after several cardiac episodes, he rarely went outside his house and spent his days worshipping Buddha and reading Buddhist Sutras.

Several other participants in the study reported similar situations when answering the items of SRHS. They noted that they engaged in basic daily activities only to prevent exacerbation of their HF condition. Family members of a number of participants

requested that the participants stay home from work or refrain from performing household chores to prevent recurrence of symptoms. Some reported that they had severe limitations because of their previous experiences, whereas others said they had no problem doing things because all they had to do were the basic activities of daily living. Participants who were used to traveling outside the country, however, perceived great limitations on their ability to engage in their hobbies. One participant remarked that since his HF diagnosis, he lacked the energy for singing, his favorite hobby, and no longer participated in that pastime with friends. He expressed concerns about that change in his life.

In the data analysis, scores for the item "health problem limited ability to do things I want" correlated with all domains of HRQOL. The psychological status domain had the highest correlation coefficient (r = -.53, p<.001), whereas, the functional status domain was the lowest (r = -.29, p<.05). Thus, a perceived limitation in doing the things the participants wanted was strongly related to adverse psychological effects.

Table 44
Associations Between Perceived Overall Health and the Remaining Items of SRHS

	Perceived overall health				
	Poor (n=43)	Fair (n=78)	Good (n=3)	Excellent (n=1)	Total (n=125)
Health problems limited ability to do the thing they wanted[1]					
A great deal	16	13	2	1	32
A little	12	34	0	0	46
Not at all	15	31	1	0	47
Compared health to 1 year ago[2]					
Not as good	37	33	1	0	71
Same	4	31	2	0	37
Better	2	14	0	1	17
Compared with most people's health in the same age[3]					
Not as good	24	21	1	0	46
Same	17	41	1	0	59
Better	2	16	1	1	20

[1]Pearson Chi-square =12.78, df = 6, p<.05
[2]Pearson Chi-square =30.12, df = 6, p<.001
[3]Pearson Chi-square =17.70, df = 6, p<.01

Approximately 78 (62.4%) of the participants rated their overall health as fair. That finding was higher than the 48.0% in the Hu, Adler, Goldman, Weinstein, & Seeman (2005) study of 991 adults aged 60 years and older. Among those 78 participants, 16 rated their health as better than that of most people the same age; however, 21 reported they had poorer health than that of their peers. Bivariate correlation analyses showed that participants who perceived their overall health as better than that of their peers experienced better HRQOL, including physical symptom (r = .26, p<.01), psychological status (r = -.34, p<.001), and overall HRQOL (r = -.28, p<.01); however, the perception that one's health was better than that of peers correlated only with psychological status (r = .23, p<.05).

Two items with lower corrected item-total correlations less than .3 were excluded from the SRHS (Ferketich, 1991), and the remaining two items (perceived overall health and health compared to that one year ago) were summed to yield a total score for the modified SRHS. The total score of SRHS for perceived health had a negative correlation with NYHA classification and CCI-severity (both with r = -.21, p<.05); that is, the participants who perceived themselves as having better health were those whose HF was of lower NYHA classifications and who had lower severity of comorbidity. That finding supports the view that diseases, disability, and functional limitations have detrimental effects on perceived health (Johnson & Wolinsky, 1993).

Findings of Nocturnal Sleep Quality

Approximately 74.4% of the participants scored higher than 5 on the self-reported global PSQI, indicating that they had severe sleep difficulties in at least two components or that they had moderate sleep difficulties in more than three components of sleep quality (Buysse et al., 1989). Likewise, 16 (12.8%) of the participants reported a global PSQI of 15 or greater; that is, they had severe sleep difficulties in at least five areas or

moderate sleep difficulties in all domains of nocturnal sleep quality over the past month. In particular, 8 (6.4%) of the participants had been diagnosed with insomnia with or without regular medical treatments. Although the PSQI is primarily intended to measure sleep quality and identify good or poor sleepers rather than to provide a clinical diagnosis, the findings suggest a higher 1-month prevalence of insomnia among the HF participants in the current study than that in a previous study of 2045 urban community elderly (6% for total, 8% for women, and 4.5% for men) (Su, Huang, & Chou, 2004). In regard to participants with greater scores on the PSQI, however, the findings can serve as references for confirming sleep disorders and determining potential causes when using objective measurements such as diagnostic criteria and polysomnography.

Overall, the mean global PSQI score (9.06±4.64) was lower than scores for 47 patients with chronic cancer pain (12.38±4.59) (Wang, Wang, Chang, & Lin, 2007), for 47 patients with chronic daily headaches (11.64±4.35) (Wang et al., 2007), for 205 institutionalized elderly (9.35±4.89) (Lin, 2000), and for 82 first-time mothers with depression during the early postpartum period (10.99±2.65) (Huang et al., 2004). The mean global PSQI score was higher, however, than scores for 197 menopausal women (5.5±3.47) (Lu et al., 2005), for 81 first-time mothers without depression (8.17±2.75) (Huang et al., 2004), and for 61 American persons with stable systolic HF (7.21±3.39) (Redeker & Hilkert, 2005). The findings support the view that sleep can be affected by several factors, including age, psychological problems such as depression and anxiety, and particularly by medical conditions characterized by pain or other physical discomforts, such as Parkinson's disease, arthritis, and shortness of breath, which are often associated with frequent awakenings that disrupt sleep continuity (Lin, 2000; Roth, 2004).

The sleep duration (5.62±1.72 hours) for the participants in this study was shorter

than that reported in the Redeker and Hilkert (2005) study of HF patients (6.54±1.51 hours). Sleep duration was correlated with physical symptom, social functioning, and overall HRQOL, but not with functional status and psychological status. Those findings were similar to those of the Redeker and Hilkert (2005) study of 61 people with HF, which showed that sleep duration measured by Actiwatch Actigraph did not relate to any components of the HRQOL, six-minute walk test, and daytime activity. However, in the same study, time in bed (8.20±1.59 hours, ranging from 4.73 to 11.55 hours) showed a negative correlation with physical functioning (r = -.31, p<.05) and daytime activity (r = -.31, p<.05). In the current study, the mean self-reported time in bed was 7.87±1.60 hours, with a range of 4.5 hours to 13.0 hours. Time in bed was correlated with functional status (r = -.43, p<.001), social functioning (r = -.34, p<.001), and overall HRQOL (r = -.29, p<.01). The findings suggest that sleep duration is not necessarily as important for HRQOL as sleep quality for people who perceive that their sleep was refreshing upon awakening.

On the other hand, habitual sleep efficiency was important to subjective sleep quality in that the better the habitual sleep efficiency, the higher the subjective sleep quality reported by the participants with HF (r =.64, p<.001). The participants, however, reported a large proportion (47.2%) of sleep inefficiency. Overall, the participants in this study had lower habitual sleep efficiency (1.42±1.29) than did 59 American patients with HF (0.67±1.01) (Redeker & Stein, 2006), 51 Taiwanese insomniacs (0.82±1.05), 171 from the general population (0.42±0.81) (Tsai et al., 2005), and 205 institutionalized elderly people (1.04±1.01) (Lin, 2000). The participants in this study had greater habitual sleep efficiency than did those in the Wang et al. (2007) study of patients with chronic cancer pain (2.13±1.17) and with chronic headache (1.62±1.23). The bivariate correlation analyses suggested that the poor sleep efficiency could result from several conditions,

including long sleep latency, difficulties initiating and maintaining sleep (also long sleep latency), frequent sleep disturbances (such as nocturia, frequent awakenings at midnight, and early awakening), and the nonuse of sleeping medications for sleep problems. Likewise, sleep efficiency could be poor for participants experiencing several conditions at the same time.

Nocturia was the most frequent sleep disturbance, affecting 104 (83.2%) of the participants in the sample. The prevalence of nocturia was higher than it was in the Lin (2000) study of 205 institutionalized elderly (39.5%) and in the Yu et al. (2006) study of community-dwelling adults aged 40 years old or more (39%). The score for nocturia (2.51±1.29) was similar to that for 43 Western patients with lung cancer (2.67), but slightly higher than that for 36 healthy Western adults (2.06). Nocturia in HF is a consequence of an increase in the atrial natriuretic peptide hormone (Asplund, 2004). The effects of nocturnal polyuria, which include dry eyes and dry month, might partly explain the finding that 11.2% of the participants complained of dry mouth during sleep and had to get up to drink. Likewise, nocturia has been viewed as an independent concept correlated with impairments in HRQOL, including less sleep, less vitality, a decrease in emotional health (Yu, Chen et al., 2006), poorer sleep quality, and higher mortality (Asplund, 2005). In the current study, nocturia was associated with poorer global sleep quality (r = .29, p<.01), more frequent sleep disturbances (r = .37, p<.001), longer sleep latency (r = .25, p<.01), and poor subjective sleep quality (r = .27, p<.01). Likewise, it was negatively correlated with HRQOL functional status (r = -.19, p<.05), which meant that participants who reported higher frequencies of nocturia also had poorer functional status than their counterparts. However, the lack of adequate information about nocturia and sleep suggests that nocturia is an area that has been ignored in HF clinical practice.

The use of sleeping medications had positive effects on all domains of global

nocturnal sleep quality except for daytime dysfunction. The participants, however, appeared to avoid using sleeping medication despite its benefits. Of the participants, 42.4% reported poor subjective sleep quality, but only 16.8% used sleeping medication for their sleep problems once or more per week over the month prior to the interview for this study. The use of sleeping medication was lower than that in the Erickson et al. (2003) study of HF patients (32%) and the Lin (2000) study of institutionalized elderly people (38.5%). During the interviews for this study, several participants explained that they did not take sleeping medication frequently because of their concerns about sleeping medication-dependence and about interactions between sleeping medication and HF medication. In addition, a small number of the participants explained that many of their friends and physicians attributed their sleep problems to mental problems, and as a result the participants felt too embarrassed to continue seeking medical help. That finding suggests that healthcare providers should refrain from attributing sleep disorders to psychogenic illnesses when they discuss the causes of sleep disorders with Taiwanese people (Lee, 1995). By avoiding the use of psychological terms and phrases such as neurosis, anxiety, and "you worry too much," healthcare providers might be more effective in helping patients increase their adherence to sleep treatments and decrease the secondary psychological hurt associated with their sleep problems. The underlying causes of the sleep disorders, including both physical and psychological mechanisms, should be identified to help obtain accurate diagnoses and plan effective interventions.

Several factors were correlated with global sleep quality. Gender was weakly correlated with global nocturnal sleep quality, with females reporting poorer global sleep quality (10.0±4.93 vs. 8.30±4.28 for men, $t = 2.06$, $p<.05$) and sleep efficiency (1.70±1.36 vs. 1.20±1.20 for men, $t = 2.13$, $p<.05$). Gender, however, was not a predictor of global nocturnal sleep quality. According to the interviews for this study, women who

were responsible for household chores, such as preparing breakfasts for families and taking care of kids and grandkids, complained more often of sleep difficulties. Because they were physically tired, they had no problem falling asleep within a short time, but maintaining their sleep was difficult because of the stress from knowing that they had to get up on time or check on their sleeping children.

Similarly, two studies conducted in Taiwan found significant relationships between gender and sleep. Su et al. (2004) found that the prevalence of insomnia in community-dwelling women was higher than that for men, although the female gender was not an independent risk factor of insomnia. The study of a Taiwanese 2001 "social trend survey" of 39,588 citizens aged 15 years or older found that men had better sleep quality than women did, even after controlling for marital status, employment status, and number of children in the household (Chen, Kawachi et al., 2005). Gender, however, did not correlate with sleep quality in a study of American people with HF (Erickson et al., 2003) and a study of institutionalized Taiwanese elderly (Lin, 2000). Further research is necessary to clarify whether several factors, particularly socioeconomic status, mediate the effects of gender on sleep disorders in Taiwanese people with HF (Lauderdale et al., 2006).

Indeed, in the Office of National Statistics Omnibus Survey in the United Kingdom, Adams (2006) found that women with lower levels of education reported a greater quantity of sleep (> 8.5 hours/night) compared to those with higher levels of education. In men, however, total sleep quantity did not correlate with education. In the current study, participants with higher educational levels reported greater sleep efficiency (r = -.22, p<.05) and better overall sleep quality (r = -.19, p<.05). This finding regarding sleep efficiency and education was consistent with the Coronary Artery Risk Development in Young Adults (CARDIA) study, which showed that more education

correlated with greater sleep efficiency (Lauderdale et al., 2006). Additionally, education was associated with gender (*chi-square* = 33.58, *df* = 7, $p<.001$), where the women group tended to be lower educated. Approximately 53.6% of the women participants were illiterate, whereas 76.8% of the men reported an educational level of elementary school or more.

Research has found that self-reported sleep complaints are associated with NYHA classifications or are more likely to occur as NYHA classifications become worse (Principe-Rodriguez et al., 2005; Redeker & Hilkert, 2005). In the current study, a simple regression analysis indicated that NYHA classification was a predictor of global sleep quality. Participants who had higher NYHA classifications experienced poor global sleep quality ($r = .35$, $p<.001$) and all domains of nocturnal sleep quality ($r = .33$, $p<.001$ [sleep latency] to $r = .19$, $p<.05$ [daytime dysfunction]), with the exception of the use of sleeping medication ($r = .06$, $p>.05$). Higher NYHA classifications were also significantly correlated with several sleep disturbances, including inability to fall asleep within 30 minutes ($r = .28$, $p<.01$), difficulty breathing during sleep ($r = .23$, $p<.05$), and feeling too cold ($r = .25$, $p<.01$). Similarly, Erickson et al. (2003) found that NYHA classification was associated with breathing cessation during sleep, restless legs, and waking before necessary, although NYHA classification was not a predictor of significant sleep disturbances in their study.

In the present study, NYHA classification was not a predictor of global sleep quality when HRQOL physical symptom was added to the regression model, which indicated that physical symptoms diminished the effects of NYHA classification on sleep. Higher NYHA classifications were associated with greater physical symptom, including both symptom frequency and symptom burden. Participants who suffered from the symptoms of swelling ($r = -.22$, $p<.001$), fatigue ($r = -.42$, $p<.001$), and shortness of

breath (r = -.30, p<.01) reported poorer global sleep quality. Physical symptom in this study, however, was a predictor of global nocturnal sleep quality, which was inconsistent with the finding of the Erickson et al. (2003) study, which showed that HF symptoms did not predict significant sleep disorders. Results from the current study, however, might support the view that participants with more severe HF conditions and greater HF symptoms are more likely to experience sleep disorders. Further clarification is needed of whether impaired sleep quality is caused by HF itself or by sleep-related breathing disorders such as obstructive sleep apnea and central sleep apnea.

Perceived health was correlated with global sleep quality, subjective sleep quality, sleep disturbances, sleep efficiency, sleep latency, and daytime dysfunction. Information about sleep disorders and perceived health is sparse; however, Kate and McHorney (2002) found that general health perception measured by the SF-36 was correlated with insomnia in people with chronic illness. Insomnia was associated with health dissatisfaction in three Asian countries: Japan, South Korea, and Taiwan (Nomura et al., 2005). In the current study, perceived health of HF participants had a strong association with psychological status (r = .59, p<.001). Psychological status had the poorest score among the HRQOL domains. Redeker and Hilkert (2005) argued that the perception of sleep may be most relevant to mental health. Thus, improvements in perceived health may lead to improvements in psychological health and sleep disorders, and vice versa.

HRQOL social functioning explained 6.9% of the variance in global nocturnal sleep quality. Participants who had greater limitations in pursuing hobbies, recreational activities, household chores, working, visiting families or friends, and maintaining intimate relationship with loved ones, experienced higher sleep disorders. Skobel and associates (2005) found that social functioning was moderately correlated with apnea/hypopnea index in patients with HF and sleep-related breathing disorders (r = -.60,

p=.001). Dissatisfaction with social life (friendships, spouse, children, and frequency of social meetings) was a predictor of insomnia in samples aged 15 years and older taken from three general populations, namely, the United Kingdom, Germany, and Italy (Ohayon, Zulley, Guilleminault, Smirne, & Priest, 2001). Satisfaction with social life was also a protective factor against insomnia for persons of any age. Life events such as retirement, death of a spouse, and physical and mental illnesses could have a great influence on the sleep-wake pattern. For example, some participants in the current study stated that they were not bothered by sleep disorders because they had few or no life constraints that required them to keep a fixed wake-up time. Encouraging patients to continue to engage themselves in social activities is thus one of the important interventions for helping them preserve better sleep quality. Several participants, however, stated that the reason they did not engage in hobbies or recreational activities was that they were exercise intolerant. Therefore, interventions to enhance cardiopulmonary fitness have to be considered when patients are being encouraged to engage in social activities. Increases in daytime activity levels have been found to be correlated with shorter times in bed and wake times in patients with HF, though they did not correlate with global sleep quality (Redeker & Hilkert, 2005). Further research is needed on the effects of daytime activities on sleep quality.

Findings of Daytime Sleepiness

The prevalence of daytime sleepiness (24%) was similar to that in the study of HF patients (21%) (Brostrom et al., 2004), but higher than that in the study of samples aged 15 years or older taken from general populations (Ohayon et al., 1997). Daytime sleepiness did not show correlations with global nocturnal sleep quality, which partially supports the view that excessive daytime sleepiness may follow insomnia (Brostrom et al., 2004; Whitney et al., 1998). The possible reasons for the nonsignificant relationship

between daytime sleepiness and nocturnal sleep quality might be that the participants in the current study were not physically influenced by daytime sleepiness because over 64% of the participants took daytime naps everyday. Likewise, a large proportion of the participants did not suffer from HF symptoms. Research has shown that symptoms and emotional distress may bring about daytime sleepiness (Edelll-Gustaffson, 2002; Vena et al., 2006; Whitney et al., 1998; Yu, Tang, Kuo, & Yu, 2006), which might have been true for the HF participants in the current study. This study found that participants who had greater frequency and burden of fatigue and shortness of breath had more propensity to fall asleep during daytime (for both factors, r = -.26, p<.01). Likewise, the better the psychological status, the lower was the daytime sleepiness reported by the participants with HF (r = -.24, p<.01). Further research, however, is needed on patients with more severe HF conditions and symptoms to clarify the relationship between daytime sleepiness and nocturnal sleep quality.

Daytime dysfunction was the strongest predictor of daytime sleepiness in the current study. Participants who had more difficulties staying awake and keeping up enough enthusiasm to perform daily activities were more likely to fall asleep in daytime. That observation was consistent with the finding of a study of advanced lung cancer patients (Vena et al., 2006). Daytime dysfunction may be caused by HF symptoms and impairment of functional status. The current study found that fatigue was correlated with difficulty in staying awake while engaging in social activity (r = -.30, p<.01), whereas fatigue (r = -.39, p<.001), swelling (r = -.25, p<.01), and shortness of breath (r = -.31, p<.001) were associated with the problem of keeping up enough enthusiasm to get things done. Patients with greater functional impairments experienced more daytime dysfunction (r = -.26, p<.01) because they lacked the energy to engage in daily and social activities, and as a result they had difficulties in maintaining normal circadian

activity–rest patterns and overcoming poor sleep quality (Vena et al., 2006). Daytime dysfunction, however, was associated with poor subjective sleep quality in the current study.

Notably, HRQOL self-efficacy was a predictor of daytime sleepiness, which accounted for 5.4% of the variance. Participants who had lower confidence in their ability to deal with HF conditions reported a higher likelihood of daytime sleepiness. It was not clear whether the perception of poor self-efficacy in dealing with HF conditions resulted in greater reluctance to face obstacles. The decision in doing nothing about HF may result in a sedentary lifestyle, thus increasing the opportunities for falling asleep in daytime (Lauderdale et al., 2006). Likewise, self-efficacy decreased with age (r = -.19, p<.05). In a study conducted with six focus groups (Leung, Wu, Lue, & Tang, 2004), 44 Taiwanese elderly defined perceived self-efficacy as "the perception of control related to the feeling of good health," and they went on to say that "dependency is a state of loss of control." Additionally, they identified participation in social activities and service to others as sources of self-efficacy. In the current study, several elderly were illiterate and required their families' assistance to receive medical services, and they therefore were more likely to perceive themselves as useless and lacking in self-efficacy. In a study of patients with multiple sclerosis, Wassem and Dudley (2003) found that, as self-efficacy in symptom management increased, sleep and fatigue levels significantly improved. At any rate, further research is needed that examines the relationship between daytime sleepiness and HRQOL self-efficacy.

The role of BMI as a predictor of daytime sleepiness was consistent with that in a previous study (Bixler et al., 2005). However, BMI is most often related to obstructive sleep apnea (Jahaveri et al., 1995; Principe-Rodriguez et al., 2005; Rostagno et al., 2003; Sin et al., 1999). The current study did not directly analyze sleep apnea, thus, it is not

possible to determine whether higher BMI was related to sleep apnea among the participants. The BMI of this HF group was higher than normal, particularly for the younger people, indicating that some intervention was needed to help participants lose weight or prevent weight gain.

Findings of Daytime Napping

Daytime napping was prevalent in 81.6% of the participants. The prevalence of daytime napping was similar to that in the Lin (2000) study of 205 institutionalized elderly (83.9%), but lower than in the Hong (Hong, 2005) study of 80 (90%) institutionalized elderly. The duration of daytime napping (82.3±50.42 minutes) was similar to that in Hong (2005) study (82.03±45.47 minutes). In this present study, younger people had lower frequencies of daytime napping, however, older adults usually took shorter naps in the daytime. Those findings were consistent with the age-related increase in daytime napping found by Asplund (1996), but they were inconsistent with research that showed no differences in napping patterns by age, gender, and ethnicity among Taiwanese community-dwelling older adults (Lai, 2005) Additionally, daytime napping was correlated with global nocturnal sleep quality. The current study did find that daytime napping was more prevalent among HF participants who had lower levels of education and who were Taiwanese speaking. This finding supports the common perception in Taiwan society that people who are older and who are of a lower socioeconomic status are more likely to take naps during daytime (Lai, 2005).

Overall, the study findings in regard to sleep variables did not support the view that excessive daytime sleepiness is associated with poor mental health. The study did find an association, however, between poor nocturnal sleep and poor functional status (Edelll-Gustaffson, 2002; Vena et al., 2006), which supports the position that the aging process itself is not alone responsible for the increase of insomnia often reported by older

people (Ohayon et al., 2001). The three major sleep variables were not correlated with each other; however, daytime napping may be helpful for restoring energy in Taiwanese people with HF and for reducing the number and severity of their symptoms.

Findings of Health-Related Quality of Life

HRQOL and its domains. Overall, the participants appeared to have a higher mean overall summary score (70.50±19.63) on the KCCQ than those reported in several other studies (55.9 to 66.9) (Clark et al., 2003; Green et al., 2000; Masoudi et al., 2004; Shin et al., 2001). Although the current study showed an overall summary score similar to that found by Myers et al. (2006) (mean = 74.2±19), the two studies yielded different scores for the domains. For example, the score for physical symptom was the lowest (54.5±18) in the Myers et al. (2006) study, but it was the highest in the current study (74.98±21.31). The participants in both studies, however, scored symptom burden higher than symptom frequency, indicating that both sets of participants may have had HF symptoms but were less likely to perceive the burden of those symptoms than they were the frequency of the symptoms. Physical symptoms was the highest score (76.6) among the domains of the KCCQ not only in the current study but also in the Green et al. (2000) study of stable HF participants.

An explanation for the high score on symptom burden (indicating low burden of symptoms) may reflect less HF severity within the sample. Indeed, the participants with advanced HF (NYHA Classes III and III) reported lower scores on physical symptom than did the participants with NYHA Classes I and II HF (54.98±22.79 vs. 80.52±18.38, $t = 5.84$, $p<.001$). Some participants, however, may have accepted the symptom as part of their life situation. For example, a number of participants, particularly those with valvular heart diseases as precipitating factors of HF and those who had suffered HF for longer periods, reported that they had become used to living with the symptoms; as a result, they

no longer perceived that any symptoms still existed. Among those participants, however, some had observable shortness of breath during the interviews for this study. Participants who did not work or carry out household chores indicated that they perceived little burden from their HF symptoms because they engaged only in daily activities that demanded little energy.

Among the four domains, participants gave the lowest score to psychological status (65.60±24.72), which is consistent with the score (64.50) reported by Green (2000) and the same as Myers et al. (2006) study (65.2±26.0). Researchers have suggested that patients with HF experience more significant psychological problems, such as depression and anxiety, than do other cardiac patients and the normal population (Carels, 2004; Havranek et al., 2004; Hawthorne & Hixon, 1994; Riedinger et al., 2002). Yu and colleagues (2004) found that Chinese HF patients have high levels of psychological distress because of their cardiac dysfunctions and decline in functional ability. The current study found that several participants viewed HF as a terminal disease and therefore felt that they were useless and waiting to die. Researchers have suggested that both Taiwanese and Chinese patients report more negative effects of illness in the psychological domain than in the physical domain (Leung et al., 2004; Yu et al., 2004). Further qualitative research is needed to acquire more comprehensive information regarding the effect of HF on psychological status.

On the other hand, researchers have suggested that psychological problems, particularly depression, are natural characteristics of HF, and those characteristics may adversely affect the prognosis of HF. For example, recent HF studies indicate that psychological problems may be the adverse effects of the activation of renin-angiotensin-aldosterone system and the sympathetic nervous system (Dantzer & Kelley, 2007; Parissis et al., 2004; Parissis, Fountoulaki, Paraskevaidis, & Kremastinos,

2005). Those systems activate physiological adaptations, including inflammatory reactions, apoptosis processes, and neuroendocrine changes in the central nervous system, that promote survival in HF patients. In particular, cytokine overexpression has been found to play an important role in the development and worsening of depressive symptoms in people with HF.

Whatever the pathophysiological mechanism linking HF to depression, early recognition and treatment of psychological disturbances should be an important component of HF care. Researchers have found that major depression was independently related to a poor prognosis of HF, including mortality and frequent hospitalizations (Jiang et al., 2001; Rutledge, Reis, Linke, Greenberg, & Mills, 2006). Antidepressant medications should be prescribed to patients with HF to treat their depression (Parissis et al., 2005), however, due to the study findings showing that antidepressants were correlated with increased likelihood of death or cardiovascular hospitalization, continuing to closely monitor patients who are treated with antidepressants is necessary (Sherwood et al., 2007).

In the current study, the score for functional status (73.14±23.70) was similar to that (74.5±21.0) reported by Myers et al. (2006) but higher than the score (64.4) reported by Green (2000). Researchers have shown that, across different cultures, the domain of physical functioning has the lowest level of agreement of all the domains of HRQOL (Fox-Rushby & Parker, 1995). Functional status in the current study was highly correlated with physical symptoms (r = .70, p<.001). Because the HF participants reported fewer physical symptoms, it was reasonable to expect higher scores on functional status. However, the participants may have had a high willingness to perform basic daily living activities but were nevertheless reluctant to engage in physical and social activities because of their lack of energy. That argument was supported by the

study finding that a number of the participants in the current study appeared to be physically inactive. Likewise, lower functional capacity was significantly associated with lower social functioning ($r = .70$, $p<.001$).

When answering the items relative to HRQOL social functioning, several participants stated that they had formerly traveled with groups of friends or groups arranged by travel agencies; however, they had stopped traveling because they were worried that their slow pace would cause inconvenience for others. In addition, some participants with more severe symptoms expressed concerned that their visits would cause their friends discomfort and anxiety, becau se their HF symptoms could suddenly worsen anywhere and anytime. Some elderly participants said that they did not know who they could visit because most of their friends were deceased.

Overall, the study findings regarding domains of HRQOL supported the view that HRQOL is a multidimensional concept. The moderate to strong intercorrelations among the domains indicate that they strongly interact with each other. Improving one domain may also improve the remaining domains.

Demographics and HRQOL. There was no significant relationship between gender and overall HRQOL. That finding is consistent with previous findings (Westlake et al., 2002), but it contrasts with findings from the majority of the literature that addresses other HF populations. Previous studies indicated that women have a lower HRQOL than men (Friedman, 2003; Hou et al., 2004; Luttik, Jaarsma, Veeger, & van Veldhuisen, 2006; Smith et al., 2005). The women and men in the current study had similar individual and HF characteristics, except for education and type of language.

In the current study, younger participants reported higher HRQOL, which is inconsistent with the majority of previous studies in which elderly patients reported better HRQOL than younger people (Clark et al., 2003; Hou et al., 2004; Masoudi et al., 2004;

Riedinger et al., 2000). However, the current finding is similar to that of previous studies that measured HRQOL with different instruments (Gott et al., 2006; Luttik et al., 2006). In the current study, older participants were more likely to be illiterate or poorly educated, unemployed, low income, and living in rural areas. Researchers found that low social status (low income, low educational level, and unemployment) could hinder rural elderly from taking part in health-promoting behaviors, such as self-care activities and acquisition of medical information, and they therefore reported lower HRQOL (Hu et al., 2005; Li, Chen, & Kuo, 2005; Wang, 2001). The situation was particularly prevalent in the elderly HF participants who had poor functional status and lacked assistance in obtaining medical services (Luttik et al., 2006).

Education played an important role in HRQOL in this sample, accounting for 9% of the variance in overall HRQOL. This finding was similar to those reported in previous studies conducted in Taiwan and Hong Kong (Lai et al., 2005; Lam & Lauder, 2000; Tsai et al., 2004; Yu et al., 2004). That agreement among the studies may support the argument that Taiwanese people with higher education have less difficulty in receiving medical information printed in the Chinese-Mandarin language. Accordingly, they have better resources and greater ability to adjust to their illnesses and changes in life expectations, and they can employ better critical thinking in making decision about their treatments. Rockwell & Riegel (2001) found that HF patients with higher education performed better self-care. Additionally, people who were better at reading and writing Chinese engaged in more positive health-promoting behaviors (Lee & Wang, 2005). In the current study, participants who could speak Mandarin showed better functional status (79.10 vs. 67.64, $p<.01$), social functioning (74.51 vs. 64.42, $p<.05$), and overall HRQOL (74.09 vs. 67. 18, $p<.05$) than those who could speak Taiwanese only (see Table 45).

Table 45
Differences in HRQOL Between Types of Language

	Mandarin	Taiwanese	t
Functional status	79.10 (18.42)	67.64 (26.67)	2.81**
Symptom stability	50.42 (23.24)	53.46 (15.86)	-.86
Symptom frequency	66.77 (25.22)	66.64 (25.64)	.03
Symptom burden	81.53 (21.38)	81.03 (22.51)	.13
Physical symptom	74.15 (21.14)	73.83 (21.62)	.08
Self-efficacy	80.83 (25.16)	74.81 (29.77)	1.23
Psychological status	68.61 (24.81)	62.82 (24.57)	1.31
Social functioning	74.51 (23.63)	64.42 (25.58)	2.29*
Overall HRQOL	74.09 (17.73)	67.18 (20.82)	1.99*

*p< 0.05 level, **p<.01 level, ***p< 0.001 level (2-tailed).

HF characteristics and HRQOL. The length of time since diagnosis of HF was not correlated with overall HRQOL. That finding was similar to those of previous studies (Juenger et al., 2002; Wang, 2005). Of the participants in the current study who had been newly diagnosed with HF, several were in NYHA Class III. In contrast, several other participants who had had HF for a longer time did not perceive HF symptoms. In this sample, perceived severity of HF may be the more important factor in determining perception of HRQOL than the length of time since HF diagnosis. That conclusion may be supported by the weak relationship between systolic HF and poor social functioning (r = .19, p<.05) and the strong relationships among NYHA functional classification and overall HRQOL and the domains of HRQOL.

Worse NYHA functional classification was consistently predicted by all domains of HRQOL. This finding is congruent with previous research that found that NYHA classification was a correlate of HRQOL (Clark et al., 2003; Cline et al., 1999; De Jong et al., 2005; Juenger et al., 2002; Wang, 2005; Westlake et al., 2002; Yu et al., 2004). In the current study, the NYHA functional classification was the strongest predictor of HRQOL, accounting for 39.8% of the variance. The greater the HF severity, the more likely were the participants to experience lower levels of HRQOL. Approximately 74.4% of the participants, however, had stable HF conditions.

The number of medications did not relate to the HRQOL domains. The use of AECI was positively correlated with symptom stability and symptom frequency (both with r = .18, p<.05), supporting the contention that the use of HF medications can have positive effects on HRQOL by improving symptoms (Riedinger et al., 2000). The use of a calcium channel blocker was correlated with lower levels of symptom frequency (r = -.20, p<.05) and less physical symptoms (r = -.19, p<.05). Those findings supported earlier indications that HF medication may increase treatment-related effects, resulting in poor HRQOL for people with HF (Hunt et al., 2005; Riedinger et al., 2000). In addition, treatment of systolic HF entailed a greater amount of HF medication than did treatment of either diastolic or valvular HF (F = 12.27, p<.001). Likewise, the number of HF medications used increased with NYHA classification (r = .22, p<.05). Several participants in the current study complained of side effects from HF medications, such as dry mouth and swelling in the lower legs. Findings from the current study suggest that, to ensure a better HRQOL, it is important that healthcare providers take into account the HF patients' perceptions and concerns about medications. Some relationships showed statistical significance but were of unlikely clinical importance (e.g. the use of a lipid-lowering agent was associated with self-efficacy in a positive direction [r = .19, p<.01]; the use of a vasodilator had a negative relationship with social functioning [r = -.23, p<.01]).

Health-related characteristics and HRQOL. Comorbidity was a predictor of overall HRQOL in the current study. Participants with a greater number of comorbid conditions, as measured by both the Charlson Comorbidity Index and chart-review method, reported lower HRQOL than their counterparts. That finding is consistent with some previous studies (Chin et al., 2003; Clark et al., 2003; Feldman et al., 2004; Yu et al., 2004), but different from others (De Jong et al., 2005; Heo et al., 2005; Redeker &

Hilkert, 2005). Some studies, however, used a simple checklist to measure comorbid conditions, and did not separate cardiovascular health problems from noncardiovascular concomitant problems. As a result, the findings regarding comorbidity and HRQOL could vary. In the current study, the number of noncardiovascular diseases was correlated with HRQOL and not with the number of cardiovascular health problems. Braunstein and associates (2003) stated that noncardiac comorbidities are highly prevalent in older patients with HF and strongly associated with adverse clinical outcomes, such as hospitalization and mortality. Those findings, however, supported the view that the HF care has shifted from the paradigm in which HF is considered a dominant condition to a new paradigm in which HF is considered one of several comorbid conditions (Havranek et al., 2003).

Perceived health was a correlate of overall HRQOL, a finding that is similar with those of previous studies (Heo et al., 2005; Yu et al., 2004). Clark et al.(2003) and De Jong et al (2004), however, found that perceived health was not associated with HRQOL. In the current study, perceived health was influenced by NYHA classification and severity of comorbidity measured by the CCI, supporting the view that disease, disability, and functional limitation have detrimental effects on perceived health (Johnson & Wolinsky, 1993). Research studies found that perceived health was strongly correlated with mortality and worsening cardiac events (Chin et al., 2003; Havranek et al., 2001). The current study, however, did not find any correlation between perceived health and HRQOL social functioning. That lack of correlation can be explained by the fact that energetic activity may not be the norm for Chinese patients, particularly for elderly patients (Leung et al., 2004). Patients are allowed to be physical inactive and absent from social activity, regardless of the severity or lack of severity of their illnesses.

Sleep variables and HRQOL. In the current study of Taiwanese people with HF, as

sleep disorders increased, HRQOL decreased. This finding accords with the majority of previous studies involving participants with HF (Brostrom et al., 2004; Redeker & Hilkert, 2005; Skobel et al., 2005; Villa et al., 2003). Among the four domains of HRQOL, social functioning had the strongest correlation with global sleep quality (r = -.44, p<.001), whereas psychological status had the weakest correlation (r = -.28, p<.01). Table 46 shows the results of further analysis of the differences in HRQOL for good sleepers (PSQI≤5) and poor sleepers (PSQI>5). The mean differences in the four HRQOL domains between these two groups ranged from 10.53 (psychological status) to 22.14 (social functioning), indicating the large effects of sleep disorders on HRQOL. The significant influence of sleep disorders on social functioning was also found in the Brostrom et al. (2004) study with 223 HF patients in Sweden.

Table 46
Differences in HRQOL Between Good Sleepers and Poor Sleepers (n=125)

	PSQI≤5 (n=32)	PSQI>5 (n=93)	Mean Differences	t
Overall HRQOL	83.26 (11.93)	66.11 (19.88)	-17.15 (2.95)	-5.82***
Physical symptom	86.88 (14.05)	69.55 (21.63)	-17.34 (3.34)	-5.18***
Symptom frequency	80.79 (24.02)	61.85 (24.03)	-18.94 (4.92)	-3.85***
Symptom burden	92.97 (9.49)	77.24 (23.48)	-15.73 (2.96)	-5.32***
Functional status	86.98 (11.14)	68.38 (25.01)	-18.60 (3.26)	-5.71***
Psychological status	73.44 (19.68)	62.90 (25.82)	-10.53 (4.39)	-2.40*
Social functioning	85.74 (14.22)	63.60 (25.55)	-22.14 (3.65)	-6.06***
Symptom stability	58.59 (18.63)	49.73 (19.68)	-8.86 (3.98)	-2.23*
Self-efficacy	82.03 (28.80)	76.21 (29.66)	-5.82 (4.79)	-1.21

*p< 0.05 level, ***p< 0.001 level (2-tailed).

The findings above, however, were somewhat different from two other studies showing that nocturnal sleep disorders were most associated with psychological health rather than functional performance among Western people with chronic illnesses (Manocchia et al., 2001) and among Western people with HF (Redeker & Hilkert, 2005). The findings in the current study, however, were supported by Lee (1995) who showed that Taiwanese people usually attribute sleep problems to physical illness. In the traditional Chinese health belief of *Yin* and *Yang*, when night is coming (*Yin*), people

have to sleep to restore the Yin–Yang balance that reflects good health. Similarly, Hwu, Coates, and Boore (2001) found that Taiwanese patients with chronic illnesses viewed sleep as a physical health behavior necessary to restore and prepare energy for activities during the next day. When sleep disorders occur, patients may begin to be more aware of their physical functioning in carrying out daily activities and the various roles that are most affected. Likewise, poor sleep quality may affect progression of HF; thus, patients may experience more symptoms, encounter greater symptom burden, and experience less stability in their HF symptoms. A drop in HRQOL, however, could also contribute to sleep disorders because of the bidirectional relationships between sleep disorders and HRQOL.

Three predictors of overall HRQOL were subjective sleep quality, sleep disturbances, and sleep efficiency, all of which accounted for a total of 7% of the variance. Indeed, the effects of sleep disorders may be larger than the multiple regression analysis found. In this study, components of global sleep quality and HRQOL created a vicious cycle in sleep quality as indicated by their correlations in Table 30 and 35. When sleep disturbances were initiated by HF symptoms, such as nocturia and shortness of breath, sleep continuity was disrupted, resulting in a longer sleep duration and a feeling of poor sleep quality. The perception of poor sleep quality became stronger if the participants could not fall asleep within a short time (normally 15 minutes) because of sleep disruptions. Perceived sleep inefficiency was further pronounced because the time in bed was much longer than actual sleep duration. Participants noted that their sleep no longer refreshed them and restored the energy for performing their daily functions. Poor functional status could result in more sedentary lifestyles, which in turn could reduce their cardiopulmonary tolerance. Perceived lifestyle changes and frequent sleep disturbances could cause mood swings, which could also affect perceptions of sleep

quality. Likewise, engaging in few social activities could result in more opportunities for daytime napping, which again could worsen nocturnal sleep quality. Daytime dysfunction, however, resulted in the greater likelihood of falling asleep or dozing off during daytime.

Longer sleep latency was correlated with poorer HRQOL functional status. That finding was supported by the Redeker and Hilkert (2005) study. Sleep latency, however, was not associated with HRQOL psychological status (r = -.05, p>.05). Helping patients identify the potential causes including both physical and psychological mechanisms may be indicated.

The use of sleeping medication was negatively correlated with HRQOL psychological status only (r = .19, p<.05), showing that participants who took sleeping medication also reported better psychological status. The findings, however, suggest that the participants were receiving insufficient treatment for their sleep problems and needed more encouragement to seek treatment for their sleep disorders. The use of sleeping medication may be necessary for certain patients with HF; however, alternative treatments, such as music (Lai & Good, 2006) and acupoint massage (Tsay et al., 2003), are particularly important for people who are concerned about the side effects of medications.

Daytime sleepiness was correlated with overall HRQOL and all domains of HRQOL except social functioning. When participants were categorized into two groups, however, namely, those with excessive daytime sleepiness (ESS>10) and those without excessive daytime sleepiness (ESS≤10), the two groups showed significant differences in all four domains of HRQOL, indicating the important effects of daytime sleepiness on HRQOL (see Table 47). That finding is similar to the findings of previous studies showing that excessive daytime sleepiness was associated with reduced HRQOL in 223 patients with HF (Brostrom et al., 2004), in 43 patients with lung cancer (Vena et al.,

2006), in 5816 persons from general population (Baldwin et al., 2001), and in 94 Taiwanese adult patients with sleep-related breathing disorders (Wang et al., 2006). The regression model of the current study indicated that daytime sleepiness was not a predictor of HRQOL. Daytime sleepiness, however, may be independent to global nocturnal sleep quality in its effect on HRQOL in patients with HF, in that daytime sleepiness was associated with only one domain of global nocturnal sleep quality, daytime dysfunction. Further research with patients with more severe NYHA classifications may be useful to help understand the relationship between daytime sleepiness and HRQOL.

Table 47
Differences in HRQOL between Excessive Daytime Sleepiness and Without Excessive Daytime Sleepiness

	ESS≤10 (n=95)	ESS>10 (n=30)	Mean Difference	t
Physical symptom	76.24 (21.17)	66.84 (20.49)	9.40	2.17*
Symptom frequency	70.29 (24.73)	55.35 (24.23)	14.94	2.90**
Symptom burden	82.19 (21.66)	78.33 (22.70)	3.86	.84
Functional status	76.02 (22.49)	64.03 (25.46)	11.99	2.47*
Psychological status	68.95 (22.72)	55.00 (28.16)	13.95	2.47*
Social functioning	71.93 (23.57)	60.83 (28.14)	11.10	2.14*
Overall HRQOL	73.28 (18.11)	61.68 (21.87)	11.61	2.91**
Symptom stability	52.90 (19.59)	49.17 (20.22)	3.73	.90
Self-efficacy	80.26 (26.71)	69.58 (29.67)	10.68	1.86

*p< 0.05 level, **p<.01 level (2-tailed).

Ohayon et al. (2001) found that social interactions had no influence on napping. In keeping with the findings regarding daytime sleepiness, however, the current study showed that poor HRQOL social functioning was correlated with greater frequency of daytime napping. Likewise, participants with poor levels of perceived health and greater numbers of concomitant health problems reported higher frequencies and longer durations of daytime napping. This finding may suggest that the use of naps to restore energy among Taiwanese people with HF is common. Likewise, the current study found that longer daytime napping was correlated with lower symptom frequency, suggesting

that daytime napping may slow the occurrence of HF symptoms. Further research is needed, however, to clarify the effects of daytime napping on HF.

Issues Related to Conceptual Model

Because there was no existing theoretical framework for HRQOL and sleep disorders, a conceptual model was developed to guide the current study. The study findings supported some aspects of the model. For example, the data showed that demographic characteristics, including age, education, financial status, and type of language, were correlates of HRQOL. On the other hand, the data did not support relationships between gender, marital status, living arrangement, and HRQOL, and further research is required to clarify those associations. Among the HF characteristics, NYHA functional classification presented the strongest association with HRQOL among the variables. NYHA classification also had significant effects on global nocturnal sleep quality. Future research, however, is necessary to clarify relationships between LVEF, type of HF, length of time since HF diagnosis, and HRQOL. The study findings supported relationships between health-related characteristics, including comorbidity and perceived heath, and sleep variables, including global nocturnal sleep quality and daytime sleepiness. Likewise, a weak relationship was found between daytime napping and social functioning. The study findings, however, did not support any causal relationships among the major variables in the conceptual model because of the limitations of the study design. Further longitudinal research is suggested to explore the long-term effects of correlates and causal relationships among the variables in the population with HF.

Implications and Recommendations

The findings of the study have several implications for nursing practice, nursing education, and for future research. Each of these will be described.

Nursing Practice

1. NYHA functional classifications played an important role in both HRQOL and sleep disorders. Assessing patients' perceptions of their HF severity and impact on HRQOL is important as a part of HF care and teaching. HF is a long-term illness, often associated with certain functional difficulties and characterized by life-threatening exacerbations that result in multiple problems for patients and their families.
2. Sixteen factors were found to be associated with HRQOL in Taiwanese people with HF suggesting that HRQOL is an extremely complex concept. Nurses should use a holistic perspective to help patients understand and manage the impact of HF on their daily lives. Effective interventions for improving HRQOL should be designed based on patients' needs.
3. Healthcare providers should carefully assess patients' perceptions of HF symptoms as well as use clinical observation skills to evaluate for the presence of symptoms. , Participants were less likely to perceive the burden of their symptoms than they were the frequency of the symptoms. This may have resulted from participants' adaptation to their symptoms and the adoption of more sedentary daily activities. Patients, however, may overlook the severity of their symptoms and postpone treatment when symptoms are gradually getting worse.
4. Since psychological status had the lowest score among HRQOL domains, routinely assessing HF patients' emotional status is recommended. Depression is a common finding in people with HF. Interventions, such as encouraging patients to express their concerns, providing opportunities to talk, and appropriately referring patients for counseling should be considered.
5. Nurses and other healthcare providers should to pay particular attention to the needs of illiterate or nearly illiterate patients. The study findings supported the position that

healthcare providers needed to direct more educational efforts toward health promotion and maintenance within the illiterate or poorly educated population. Providers should also be aware of patients' literacy levels before they distribute written teaching materials. Spoken explanations are particularly needed for Taiwanese people. In addition, efforts should be made to evaluate patients' understanding of the teaching, encourage them to ask questions, and to clarify points of misunderstanding. Furthermore, the families should become involved in the patient teaching or educational programs to increase the educational effects of the programs.

6. Many of the participants in this study were obese and lacked physical activity in their lives. Sometimes the inactivity was in response to family member requests to restrict activities to prevent the recurrence of symptoms. Nurses are ideal teachers for helping patients safely design exercise plans. We should communicate with family members about the importance of physical activity to promote patients' cardiopulmonary fitness and how to engage in safely physical activity.
7. The importance of ongoing screening for sleep disorders in people with HF is highlighted based on the study findings about the prevalence of low global nocturnal sleep quality and daytime sleepiness among the participants in this study. Nurses should encourage patients to describe their sleep symptoms in detail and any related HRQOL impairments. Early detection of sleep disorders may help healthcare providers minimize potential poor outcomes and improve health-related quality of life in people with HF.
8. Effective interventions for sleep disorders in patients with HF should be designed in accordance with each patient's life style. Many participants in the study who experienced nocturia habitually drank tea in the afternoon. Attempts to manage nocturia in that group would include teaching the participants to avoid excessive fluid

intake late in the day and consulting with physicians about the timing of prescription diuretic medications (Asplund, 2005). Interventions for sleep disorders should focus on both pharmacologic (e.g. sleeping medication) and nonpharmacological treatments (e.g. relaxation strategies). Nurses should consider significant impact of sleep disorders on HRQOL and avoid viewing patients' sleep problems only from the psychological perspective. Instead, we should investigate sleep disorders from multiple perspectives.

Nursing Education

1. Sleep disorders are common in people living with HF and content about the topic needs to be incorporated into nursing curricula. Specifically, knowledge about sleep disorders and HRQOL among people with HF should be taught to nursing students around the world. To foster students' knowledge in this area, nursing faculty should include HRQOL, sleep hygiene, sleep assessment, and sleep-related pathophysiology. As a result, students will be better able to help patients evaluate and manage sleep disorders.
2. HRQOL is an important concept that should be included in basic and advanced nursing education to prepare future nurses to address health needs of people with chronic conditions, such as HF. Participants in the current study expressed the importance of seeing HRQOL from a multidimensional perspective.
3. HF is a lethal condition affecting millions of people around the world. Evidence-based treatment of HF should be incorporated into the nursing curricula to help nursing students better care for this population. As a result, they may be better able to teach patients about their HF treatment and to judge whether the treatments have caused any unexpected side effects. Some prescribed HF medications were found to be associated with HRQOL in the current study.

Nursing Research

1. Findings from this cross-sectional correlational study could serve as a baseline for further longitudinal studies of HRQOL and sleep conditions in Taiwanese people with HF. The use of a longitudinal study design would be helpful in identifying predictors of HRQOL over time and ascertaining causal relationships between sleep variables and HRQOL. HF is a chronic disease that requires long-term treatment and can result in changes in HRQOL over time.
2. The study examined the relationships between nocturnal sleep quality, daytime sleepiness, daytime napping, and HRQOL in people with HF. Replication studies are needed to support the findings of this current study. Future research also can compare the study findings with other research studies and population.
3. The combination of two HRQOL instruments may provide richer information and reveal diverse perspectives regarding the impact of HF on HRQOL. Different instruments for self-reporting HRQOL may measure HRQOL from varied perspectives. Because HRQOL is a multidimensional concept, the use of only one instrument may overlook other dimensions of this complex concept.
4. The low level of Cronbach's alpha of the SRHS may suggest that this subscale was not appropriate to be used to measure perceived health in the participants with HF. Modifing the scale options may be helpful to make the SRHS more plausible and applicable since the participants tended to answer the questions with a neutral manner.
5. The study supported that belief that psychological problems are common in people with HF across different cultures. Future research could focus on neuroendocrine changes related to depression and levels of cytokines to help build an understanding of the pathophysiological mechanisms in Taiwanese people with HF. Such research

would help healthcare providers to not only accurately diagnose psychological problems in people with HF, but also to plan and administer effective interventions.

6. Future qualitative research studies are needed to explore patients' subjective perception about effects of HF on HRQOL, particularly the domain of psychological status. Adding an instrument to measure depression or mood state may be helpful to provide more comprehensive information about this area.
7. Multiple methods for documenting sleep problems for people with HF are recommended in future studies. Two valuable methods for obtaining objective data on sleep disorders are polysomnography and Actiwatch Actigraphy. Nocturnal polysomnography, the gold standard confirmatory laboratory technique in the diagnosis of sleep disturbances, has provided researchers extensive data on sleep disturbances, especially sleep-related breathing disorders (Bootzin et al., 1994). Research has also supported the ability of Actiwatch Actigraphy to accurately identify sleep arousals in a simple and time-saving manner (Pillar et al., 2003). Moreover, the technique can be used in the home environment. Overall, both subjective and objective measures are necessary to better understand sleep problems in patients with HF. In addition, an activity diary that records daytime sleepiness and daytime napping may be useful for capturing a participant's propensity to fall asleep or dose off.
8. The relationship between physical activity and sleep quality in this population should be further clarified. Furthermore, the use of objective measures would help to explore the extent to which HF patients engage in physical activity.
9. Studies that test the effects of specific interventions for sleep disorders and HRQOL are highly recommended. Some patients can improve their HF conditions if they can improve their sleep quality (Leung & Bradley, 2001; Trupp, 2004). Several participants in the current study, however, were concerned about the interaction

effects between sleeping medications and HF medications. More research, therefore, is needed that addresses the design of effective nonpharmacological interventions for sleep disturbances for this population.

Summary

This chapter has presented a summary and discussion of the study findings. In addition, the chapter included the implications and recommendations in three areas: nursing practice, nursing education, and nursing research. Overall, the study has added to our knowledge of HRQOL and sleep disorders in Taiwanese people with HF. In particular, the study findings supported the existence of relationships between HRQOL and sleep disorders in Taiwanese people with HF. From those findings, interventions should be designed to help improve HRQOL and reduce sleep disorders for this population.

Appendix A

Cover Letters

Title: Health-Related Quality of Life and Sleep Disorders in People Living with Heart Failure.

Conducted by: Hsing-Mei Chen
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Email address: hsingmei@mail.utexas.edu

IRB PROTOCOL # 2006-09-0058
Telephone: 0987038359

Sponsor: Angela Clark, PhD, RN, CNS, FAAN, FAHA, Associate Professor,
Telephone: 512-471-9078 . Email address: apclark@mail.utexas.edu

You are being asked to participate in a research study. This form provides you with information about the study. Please read the information below and ask questions about anything you don't understand before deciding whether or not to take part. Your participation is entirely voluntary and you can refuse to participate without penalty or loss of benefits to which you are otherwise entitled. You can stop your participation at any time by simply telling the researcher.

The purpose of this study is to understand how the quality of life and sleep are affected when one has heart failure. This study will enroll 125 Taiwanese participants.

If you decide to participate, I will invite you to fill out a set of questionnaires, which include personal information, such as, age, education, and married status, questions about your sleep conditions and health-related quality of life. After obtaining your permission, I will collect information about your heart failure condition from your medical record. At your convenience, you can fill-out the questionnaires in the clinic or at your home. If you choose to do it at home, a stamped pre-addressed envelope will be given to you to mail it back.

Total estimated time to take part in the study will be about 30-60 minutes.

Risks: The risk associated with this study is no greater than everyday life. No discomfort, physical or emotional harm is anticipated as a result of being in this study. You can stop or postpone the participation if you feel discomfort, such as dyspnea and fatigue. You can also withdraw voluntarily from the study at any time without adversely affecting your health care.

Benefits: Although there is no direct benefit to you, you may benefit from knowing that you are helping researchers learn more about heart failure in Taiwanese people.

Privacy and Confidentiality: All of the questionnaires and codebook will be stored in a locked cabinet in the principal investigator's home. Only the principal investigator can access the codebook ad questionnaires. Any information that is obtained in connection with this study and that can be identified with you will remain confidential. Authorized persons from The University of Texas at Austin, and members of the Institutional Review Board have the legal right to review your research records and will protect the confidentiality of those records to the extent permitted by law. Any publications or presentations will exclude any information that will make it possible to identify you as a subject. Any identifying information, codebook, and questionnaires will be destroyed after the study is published.

Contacts and Questions:
If you have any questions, please ask me. If you have questions later or want additional information, you may call me. You may also contact my supervisor: Angela P. Clark, PhD, RN. Our phone numbers and e-mail addresses are at the top of this page. If you have questions about your rights as a research participant, please contact Lisa Leiden, PhD, Chair, The University of Texas at Austin Institutional Review Board for the Protection of Human Subjects, +1-512-232-4383.
You may keep this letter for your records.

研究題目: 台灣心臟衰竭病患健康相關生活品質與睡眠障礙

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您被邀請參與這個研究，這份資料將提供您有關這個研究的訊息。主要研究者會向您說明整個研究內容及回答您所有的問題，在您決定是否要參與這個研究之前，請閱讀以下訊息並提出任何疑問。您的參與完全是自願的，拒絕參與並不會有任何懲罰或利益損失，您可以在任何時間以口頭告知研究者您想停止參與這個研究。

本研究的目的是在探討台灣心臟衰竭病患健康相關生活品質與睡眠障礙的關係，這個研究需要 125 位參與者。

如果您同意參與本研究，我將邀請您回答數份問卷，這些問卷是有關個人基本資料(例如年齡、教育程度跟婚姻狀況)、健康相關生活品質與睡眠情形。此外，在取得您的同意後，我將由您的病歷中收集有關您的心臟衰竭狀況。您可依您方便的時間在門診或在家填答這些問卷。如果您選擇在家填答，您將會收到一個回郵信封以便您寄回問卷給研究者。

估計參與本研究時間約30-60分鐘。

參與本研究的**危險性:** 參與本研究的危險性小於每天日常生活可能帶來的危險，沒有已知會因爲參與這項研究所造成的不舒服、身體或情緒上的傷害。如果您覺得不舒服，例如呼吸喘與疲倦，您可以隨時終止討論或填答問卷。不論是否參加這個研究都不會影響您的健康照顧。您可以隨時退出這個研究，您的決定並不會影響您的健康照護。

參與本研究的**利益:**雖然本研究對您並無直接利益，但您可能會因知道您正在幫助研究者了解更多有關台灣民眾心臟衰竭情形而獲益。

隱私與機密: 本研究資料將受到嚴密保管。任何您提供給本研究的資料將維持機密，只有主要研究者可以使用您的資料。經由德州大學奧斯汀校區授權的人以及人權審核委員才有合法權利閱讀您的研究紀錄，並且依照法律維護您的個人隱私。所有發表將會將移除可能指出您曾參與本研究的訊息。所有研究資料包括問卷與相關研究資料將會在研究成果發表後銷毀。

如果您有任何有關本研究的問題，您可以現在問我。若您稍後有問題或需要額外訊息，您可以打電話得我或跟我的指導教授連絡，我們的聯絡電話與電子郵件信箱列在本說明書最上方。如果您的問題是關於作爲一個研究參與者的權利，請連絡美國德州大學奧斯汀校區人權審核委員會主席麗莎來登(Lisa Leiden, PhD)，電話：+1-512-232- 4383。

您可以保留這份說明書以作爲您日後參考依據。

Appendix B

Questionnaires--English

Demographic Data ID:

Birth Date:_____ Gender: ☐Female ☐Male

Body Height:_____cm Body Weight:_____Kilogram

How long since the diagnosis of heart failure? Year_____Month_____

Married Status: ☐Married ☐Separated ☐Divorced ☐Widow/Widower

☐Single ☐Other (please write down) _____

Education: ☐Illiterate, No Schooling ☐Literate, but no formal schooling ☐ Elementary School ☐Junior high school ☐High school ☐Junior College ☐College ☐Graduate School ☐Other___

Living Arrangement: ☐Alone ☐Living with Families ☐Living with Friends ☐Nursing Home ☐Other _____

Employed Status: ☐Yes ☐No ☐ Unemployed due to disability ☐Retired Other_____

Financial Status: ☐Poor, not enough for daily expenses ☐some, merely enough for daily expenses ☐Adequate, very sufficient for daily expenses ☐Other_____

Language: ☐Taiwanese ☐Mandarin ☐Both above ☐Other _____

Data from practice medical record:

New York Heart Association Functional Classification:_____

Ejection Fraction:_____ Heart Failure: ☐systolic ☐diastolic

Medications: ☐ACEI_____ ☐Beta-Blocker_____
☐ARB_____ ☐Diuretic_____
☐Digitalis_____ ☐Aldosterone Inhibitor_____
☐Vasodilator_____ ☐alpha adrenergic antagonist_____
☐Blood thinner_____ ☐ASA_____
☐Anti-lipid_____

Concomitant Health Problems

☐ Other CVD= hypertension, atrial arrhythmia, ventricular arrhythmias, ICD, Pacemaker, valvular heart disease, EP ablation, peripheral artery disease, CABG, angina, MI, CAD, cardiac PCI (angioplasty, stent), dyslipidemia, or_____

☐ Diabetes= type 1, type 2

☐ Thyroid= hypothyroidism, hyperthyroidism, goiter

☐ Pulmonary= asthma, emphysema, chronic bronchitis, COPD, or_____

☐ Renal= chronic renal insufficiency, hemodialysis, peritoneal dialysis, or_____

☐ GI= chronic hepatitis, cirrhosis, ulcers, or_____

☐ Neuro= CVA, TIA, carotid artery surgery/angioplasty, dementia, Alzheimer, or _____

☐ Cancer=_____

☐ Musculoskeletal= RA, osteoarthritis, or_____

☐ Psych/MH= depression, alcohol abuse, chronic pain, dementia, or _____

☐ Other:_____

Resource:

Radford, M. J., Arnold, J. M. O., Bennett, S. J., Cinquegrani, M. P., Cleland, J. G. F., Havranek, E. P., et al. (2005). ACC/AHA key data elements and definitions for measuring the clinical management and outcomes of patients with chronic heart failure. *Circulation, 112*, 1888-1916.

Comorbidity Questionnaire

Please check which of the following medical conditions you have. If you do not have a condition, please check "no."

Myocardial infarction:
1. Have you ever had a heart attack? ____(1) Yes ____(0)No

Congestive heart failure:
2. Have you ever been treated for heart failure? (You may have been short of breath and the doctor may have told you that you had fluid in your lungs or that your heart was not pumping well.) ____(1) Yes ____(0)No

Peripheral vascular disease:
3. Have you had an operation to unclog or bypass the arteries in your legs?
___(1) Yes ___(0)No

Cerebrovascular accident:
4. Have you had a stroke, cerebrovascular accident, blood clot or bleeding in the brain, or transient ischemic attack (TIA)? ____(1) Yes ____(0)No

Hemiplegia:
4a. Do you have difficulty moving an arm or leg as a result of the stroke or cerebrovascular accident? ____(1) Yes ____(0)No

Chronic obstructive pulmonary disease:
5. Do you have asthma? ____(1) Yes ____(0)No
If yes, do you take medicines for your asthma? ____(1) Yes ____(0)No
If yes, only with flare-ups of my asthma? ____(1) Yes ____(0)No
I take medicines regularly, even when I'm not having a flare-up. ___(1) Yes ___(0)No
6. Do you have emphysema, chronic bronchitis, or chronic obstructive lung disease?
____(1) Yes ____(0)No
If yes, do you take medicines for your lung disease? ____(1) Yes ____(0)No
If yes, only with flare-ups? ____(1) Yes ____(0)No
I take medicines regularly, even when I'm not having a flare-up. ___(1) Yes ___(0)No

Ulcer disease:
7. Do you have stomach ulcers, or peptic ulcer disease? ____(1) Yes ____(0)No
If yes, has this condition been diagnosed by endoscopy (where a doctor looks into your stomach through a scope) or an upper GI or barium swallow study (where you swallow chalky dye and then x-rays are taken)? ____(1) Yes ____(0)No

Diabetes:
8. Do you have diabetes (high blood sugar)? ____(1) Yes ____(0)No

8a. If yes, treated by modifying my diet? ____(1) Yes ____(0)No
8b. If yes, treated by medications taken by mouth? ____(1) Yes ____(0)No
8c. Treated by insulin injections? ____(1) Yes ____(0)No
8d. Has the diabetes caused problems with your kidneys? ____(1) Yes ____(0)No
8e. Has the diabetes caused problems with your eyes, treated by an ophthalmologist?
____(1) Yes ____(0)No

Renal:
9. Have you ever had poor kidney function (blood tests show high creatinine)?
____(1) Yes ____(0)No
9a. Have you used hemodialysis or peritoneal dialysis? ____(1) Yes ____(0)No
9b. Have you received kidney transplantation? ____(1) Yes ____(0)No

Connective tissue disease:
10. Do you have rheumatoid arthritis? ____(1) Yes ____(0)No
10a. If yes, do you take medications for it regularly? ____(1) Yes ____(0)No
10b. Do you have Lupus (systemic lupus erythematosus)? ____(1) Yes ____(0)No
10c. Do you have Polymalgia rheumatica? ____(1) Yes ____(0)No

Dementia, liver disease, leukemia, lymphoma, tumor, metastases, AIDS:
11. Do you have any of the following conditions?
11a. Alzheimer's Disease, or another form of dementia? ____(1) Yes ____(0)No
11b. Cirrhosis, or serious liver damage? ____(1) Yes ____(0)No
11c. Leukemia or polycythemia vera?____(1) Yes ____(0)No
11d. Lymphoma? ____(1) Yes ____(0)No
11e. Cancer, other than skin cancer, leukemia or lymphoma? ____(1) Yes ____(0)No
11f. If yes, has the cancer spread, or metastasized to other parts of your body?
____(1) Yes ____(0)No
11g. AIDS? ____(1) Yes ____(0)No

Resource:

Katz, J. N., Chang, L. C., Sangha, O., Fossel, A. H., & Bates, D. W. (1996). Can comorbidity be measured by questionnaire rather than medical record review? *Medical Care, 34*, 73-84.

Self-Rated Health Subscale

Please answer the following four questions by CIRCLING the answer which you think best describes your own health.

1.How would you rate your overall health at the present time?

☐ excellent ☐ good ☐ fair ☐ poor

2.Is your health now better, about the same, or not as good as it was one year ago?

☐ better ☐ same ☐ not as good

3.Do your health problems stand in the way of your doing the things you want?

☐ not at all ☐ a little ☐ a great deal

4.Would you say that your health is better, about the same, or not as good as most people your age?

☐ better ☐ same ☐ not as good

Resource:

Lawton, M. P., Moss, M., Fulcomer, M., & Kleban, M. H. (1982). A research and service oriented multilevel assessment instrument. *Journal of Gerontology, 37*, 91-99.

The Kansas City Cardiomyopathy Questionnaire

The following questions refer to your heart failure and how it may affect your life. Please read and complete the following questions. There are no right or wrong answers. Please mark the answer that best applies to you.

1. Heart failure affects different people in different ways. Some feel shortness of breath while others feel fatigue. Please indicate how much you are limited by **heart failure** (shortness of breath or fatigue) in your ability to do the following activities over the past 2 weeks.

Place an X in one box on each line

Activity	Extremely Limited	Quite a bit Limited	Moderately Limited	Slightly Limited	Not at all Limited	Limited for other reasons or did not do the activity
Dressing yourself	☐	☐	☐	☐	☐	☐
Showering/ Bathing	☐	☐	☐	☐	☐	☐
Walking 1 block on level ground	☐	☐	☐	☐	☐	☐
Doing yardwork, housework or carrying groceries	☐	☐	☐	☐	☐	☐
Climbing a flight of stairs without stopping	☐	☐	☐	☐	☐	☐
Hurrying or jogging (as if to catch a bus)	☐	☐	☐	☐	☐	☐

2. Compared with 2 weeks ago, have your symptoms of heart failure (shortness of breath, fatigue or ankle swelling) changed?

My symptoms of heart failure have become…

Much worse	Slightly worse	Not changed	Slightly better	Much better	I've had no symptoms over the last 2 weeks
☐	☐	☐	☐	☐	☐

3. Over the past 2 weeks, how many times did you have swelling in your feet, ankles or legs when you woke up in the morning?

Every morning	3 or more times a week, but not every day	1-2 times a week	Less than once a week	Never over the past 2 weeks
☐	☐	☐	☐	☐

4. Over the past 2 weeks, how much has swelling in your feet, ankles or legs bothered you?

It has been …

Extremely bothersome	**Quite a bit** bothersome	**Moderately** bothersome	**Slightly** bothersome	**Not at all** bothersome	I've had **no swelling**
☐	☐	☐	☐	☐	☐

5. Over the past 2 weeks, on average, how many times has **fatigue** limited your ability to do what you want?

All of the time	Several times per day	At least once a day	3 or more times per week but not every day	1-2 times per week	Less than once a week	Never over the past 2 weeks
☐	☐	☐	☐	☐	☐	☐

6. Over the past 2 weeks, how much has your **fatigue** bothered you?

It has been. ..

Extremely bothersome	**Quite a bit** bothersome	**Moderately** bothersome	**Slightly** bothersome	**Not at all** bothersome	I've had **no fatigue**
☐	☐	☐	☐	☐	☐

7. Over the past 2 weeks, on average, how many times has shortness **of breath** limited your ability to do what you wanted?

All of the time	Several times per day	At least once a day	3 or more times per week but not every day	1-2 times per week	Less than once a week	Never over the past 2 weeks
☐	☐	☐	☐	☐	☐	☐

8. Over the past 2 weeks, how much has your shortness **of breath** bothered you?

It has been. ..

Extremely bothersome	**Quite a bit** bothersome	**Moderately** bothersome	**Slightly** bothersome	**Not at all** bothersome	I've had **no shortness of breath**
☐	☐	☐	☐	☐	☐

9. Over the past 2 weeks, on average, how many times have you been forced to sleep sitting up in a chair or with at least 3 pillows to prop you up because of shortness of breath?

Every night	3 or more times a week, but not every day	1-2 times a week	Less than once a week	Never over the past 2 weeks
☐	☐	☐	☐	☐

10. Heart failure symptoms can worsen for a number of reasons. How sure are you that you know what to do, or whom to call, if your heart failure gets worse?

Not at all sure	**Not very** sure	**Somewhat** sure	**Mostly** sure	**Completely** sure
☐	☐	☐	☐	☐

11. How well do you understand what things you are able to do to keep your heart failure symptoms from getting worse? (for example, weighing yourself, eating a low salt diet, etc.)

Do not understand at all	Do not understand very well	Somewhat understand	Mostly understand	Completely understand
☐	☐	☐	☐	☐

12. Over the past 2 weeks, how much has your heart failure limited your enjoyment of life?

It has extremely limited my enjoyment of life	It has limited my enjoyment of life quite a bit	It has moderately limited my enjoyment of life	It has slightly limited my enjoyment of life	It has not limited my enjoyment of life at all
☐	☐	☐	☐	☐

13. If you had to spend the rest of your life with your heart failure the way it is right now, how would you feel about this?

Not at all satisfied	**Mostly dissatisfied**	**Somewhat** satisfied	**Mostly** satisfied	**Completely** satisfied
☐	☐	☐	☐	☐

14. Over the past 2 weeks, how often have you felt discouraged or down in the dumps because of your heart failure?

I felt that way **all of the time**	I felt that way **most of the time**	I **occasionally** felt that way	I **rarely** felt that way	I **never** felt that way
☐	☐	☐	☐	☐

15. How much does your heart failure affect your lifestyle? Please indicate how your heart failure may have limited your participation in the following activities over the past 2 weeks.

Please place an X in one box on each line

Activity	**Severely** Limited	**Limited** Quite a bit	**Moderately** Limited	**Slightly** Limited	**Do not** Limited	Does not apply or did not do for other reasons
Hobbies, recreational activities	☐	☐	☐	☐	☐	☐
Working or doing household chores	☐	☐	☐	☐	☐	☐
Visiting family or friends out of your home	☐	☐	☐	☐	☐	☐
Intimate relationships with loved ones	☐	☐	☐	☐	☐	☐

Resource:

Green, C. P., Porter, C. B., Bresnahan, D. R., & Spertus, J. A. (2000). Development and evaluation of the Kansas City Cardiomyopathy Questionnaire: A new health status measure for heart failure. *Journal of the American College of Cardiology, 35*, 1245-1255.

Pittsburgh Sleep Quality Index (PSQI)

INSTRUCTIONS:
The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

1. During the past month, what time have you usually gone to bed at night?

   BED TIME _____

2. During the past month, how long (in minutes) has it usually taken you to fall asleep each night?
   NUMBER OF MINUTES _____

3. During the past month, what time have you usually gotten up in the morning?

   GETTING UP TIME _____

4. During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spent in bed.)

   HOURS OF SLEEP PER NIGHT _____

For each of the remaining questions, check the one best response. Please answer all questions.

5. During the past month, how often have you had trouble sleeping because you . . .

a) Cannot get to sleep within 30 minutes

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week _____

b) Wake up in the middle of the night or early morning

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

c) Have to get up to use the bathroom

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

d) Cannot breathe comfortably

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

e) Cough or snore loudly

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

f) Feel too cold

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

g) Feel too hot

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

h) Had bad dreams

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

i) Have pain

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

j) Other reason(s), please describe_____
How often during the past month have you had trouble sleeping because of this?

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

6. During the past month, how would you rate your sleep quality overall?

Very good _____ Fairly good _____ Fairly bad _____ Very bad _____

7. During the past month, how often have you taken medicine to help you sleep (prescribed or "over the counter")?

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

8. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

9. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

No problem at all _____ Only a very slight problem_____
Somewhat of a problem_____ A very big problem_____

10. Do you have a bed partner or room mate?

No bed partner or room mate _____ Partner/room mate in other room_____
Partner in same room, but not same bed _____ Partner in same bed _____

11.If you have a room mate or bed partner, ask him/her how often in the past month you have had . . .

a) Loud snoring

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

b) Long pauses between breaths while asleep

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

c) Legs twitching or jerking while you sleep

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

d) Episodes of disorientation or confusion during sleep

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

e) Other restlessness while you sleep; please describe _____

Not during the past month_____	Less than once a week_____	Once or twice a week_____	Three or more times a week_____

Resource

Buysse, D. J., Reynolds, Ⅲ. C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. *Psychiatry Research, 28*, 193-213.

The Epworth Sleepiness Scale

How likely are you to dose off or fall asleep in the following situations, in contrast to feeling just tired? This refers to your usual way of life in recent times. Even if you have not done some of these things recently try to work out how they would have affected you. Use the following scale to choose the most appropriate number for each situation:
0— would never doze; 1—light chance of dozing; 2—moderate chance of dozing; 3—high chance of dozing.

1. Sitting and reading	0	1	2	3
2. Watching TV	0	1	2	3
3. Sitting, inactive in a public place (e.g. a theater or a meeting)	0	1	2	3
4. As a passenger in a car for an hour without a break	0	1	2	3
5. Lying down to rest in the afternoon when circumstances permit	0	1	2	3
6. Sitting and taking to someone	0	1	2	3
7. Sitting quietly after a lunch without alcohol	0	1	2	3
8. In a car, while stopped for a few minutes in the traffic	0	1	2	3

Resource:

Johns, M. W. (1991). A new method for measuring daytime sleepiness: The Epworth Sleepiness Scale. *Sleep, 14*, 540-545.

Do you take a nap in daytime? ☐No ☐Yes

If yes, please indicate how many times per week:_____ or check from the below answers.

☐everyday ☐5-6 times per week ☐3-4 times per week ☐1-2 times per week

How long for the napping each time _____hours _____minutes

Thanks so much for completing the questionnaires!

Appendix C

Questionnaires--Chinese

Demographic Questionnaire (Chinese Version)

個人基本資料

ID:

出生年月日：_____　　性別：☐女　☐男

身高：_____公分　　體重：_____公斤

患心臟衰竭已____年____月

婚姻狀況：☐已婚　☐分居　☐離婚　☐喪偶　☐未婚　☐其它_____

教育程度：☐不識字　☐識字，未曾上學或小學肄業　☐小學畢業　☐國中畢業
☐高中畢業　☐專科
☐大學　☐研究所或以上　☐其它_____

居住狀況：☐獨居　☐與家人同住　☐與朋友同住　☐安養院與其它機構
☐其它_____

職業：☐有　☐無　☐因疾病失去工作　☐退休　☐其它_____

經濟狀況：☐差，不夠日常生活開銷　☐正好足夠日常生活開銷
☐很好，非常足夠日常生活開銷　☐其它_____

語言: ☐國語　☐台語　☐以上二種

病歷資料收集 (**Data from practice medical record)**

紐約心臟功能分類：_____　　心射出率：_____

心衰竭：☐收縮性　☐舒張性

Medications: ☐ACEI_____　☐Beta-Blocker_____

☐ARB_____　☐Diuretic_____

☐Digitalis_____　☐Aldosterone Inhibitor_____

☐Vasodilator_____　☐alpha adrenergic antagonist_____

☐Blood thinner_____　☐ASA_____

☐Lipid-Lower _____　☐Calcium Blocker _____

☐ Anti-Arrhythmia _____

其它健康問題

☐ 其它心血管疾病=高血壓、心房性心律不整、心室性心律不整、體內去顫電擊器、體內激搏器、瓣膜性心臟病、電燒、週邊動脈疾病、冠狀動脈繞道手術、心絞痛、心肌梗塞、冠狀動脈疾病、經皮冠狀動脈治療(血管成型術、血管支架)、血脂異常、或其它_____

☐ 糖尿病= 第一型、第二型

☐ 甲狀腺= 功能低下、功能亢進、甲狀腺腫

☐ 肺部疾病= 氣喘、肺氣腫、慢性支氣管炎、或慢性阻塞性肺疾病、或_____

☐ 腎臟疾病= 慢性腎功能缺失、血液透析、腹膜透析， 或_____

☐ 腸胃疾病= 慢性肝炎、肝硬化、潰瘍、或_____

☐ 神經系統= 中風、短暫性缺血發作、頸動脈手術/血管成型術、失智、阿茲海莫症、或_____

☐ 癌症= _____

☐ 肌肉骨骼疾病= 風濕性關節炎、骨性關節炎、或_____

☐ 心理方面= 憂鬱、酒精濫用、慢性疼痛、或_____

☐ 其它= _____

Self-Reported Charlson Comorbidity Index (Chinese Version)

疾病史

請勾選您罹患的疾病，如果您並沒有該項疾病或情況，請選“無”。

		有	無
心肌梗塞			
1.	您曾心臟病發作過?		
心臟衰竭			
2.	您曾接受心臟衰竭治療?		
週邊血管疾病			
3.	您的小腿動脈曾開刀清除血栓或進行繞道手術?		
中風			
4.	您曾有中風、腦部血栓或出血、或短暫缺血性發作?		
半身癱瘓			
5.	您因爲中風而有困難移動手或腳?		
慢性阻塞性肺疾病			
6.	您有氣喘嗎?		
6a.	若有，有服用藥物嗎?		
6b.	您只有在發作時服用?		
6c.	您規則服藥，甚至沒有發作也是?		
6d.	您有肺氣腫、慢性支氣管炎、或慢性阻塞性肺疾病嗎?		
6e.	若有，有服用藥物嗎?		
6f.	您只有在發作時服用?		
6g.	您規則服藥，甚至沒有發作也是?		
胃潰瘍			
7.	您有胃潰瘍或消化性潰瘍?		
	若有，是經由吞胃鏡、上消化道檢查或吞鋇劑檢查(吞一種白色液體之後照 X 光)所做出的診斷?		
糖尿病			
8.	您有糖尿病(高血糖)?		
8a.	若有，目前以飲食控制?		
8b.	若有，現在以口服血糖藥物控制?		
8c.	以注射胰島素控制?		
9a.	您的糖尿病已有造成腎功能問題?		
9b.	您的糖尿病已有造成眼睛問題，須接受眼科醫師治療?		
腎臟疾病			
10.	您曾有腎功能變差(抽血檢查顯示血清肌酸酐升高)?		
10a.	您曾接受洗腎或腹膜透析?		

10b.	您曾接受腎臟移植?		
結締組織疾病			
11.	您有風濕性關節炎?		
11a.	若有，您有規則服用藥物?		
11b.	您有狼瘡(全身性紅斑性狼瘡)?		
11c.	您有風濕性 多發性肌痛症		
失智症、肝疾病、白血病、淋巴瘤、腫瘤、癌症轉移、愛滋病			
您有下列任何一個疾病?			
12.	阿茲海莫疾病，或其他種類的失智症?		
13.	肝硬化，或其他肝損傷?		
14.	這肝臟損傷是中度或重度?		
15.	白血病、或真性紅細胞增多症?		
16.	淋巴瘤?		
17.	癌症，除皮膚癌、白血病、淋巴瘤外?		
18.	若有癌症，癌症已擴散或轉移到其他器官?		
19.	愛滋病?		

Self-Rated Health Subscale (Chinese Version)

自評健康狀況

請回答以下四個問題，並勾選一個最適合描述您的健康狀況的答案。

5. 您認爲您現在的整體健康狀況如何？

☐非常好 ☐好 ☐還可以 ☐差

6. 跟一年前比，您現在的健康狀況？

☐比較好 ☐相同 ☐比較差

7. 您目前的健康問題會妨礙您做您想要做的事嗎？

☐一點也不妨礙 ☐有些妨礙 ☐妨礙很多

8. 跟大多數同年齡的人比較起來，您認爲您現在的健康狀況？

☐比較好 ☐相同 ☐比較差

KCCQ (Chinese Version)

心臟衰竭對生活的影響

以下問題是有關您的**心臟衰竭**，以及這個疾病可能會如何影響您的生活。請閱讀並回答以下的問題。這些問題的答案並無所謂的對或錯。請在☐勾選最適合您的答案。

1. 心臟衰竭對不同的人有不同的影響，有些人感到呼吸急促 (喘)，而有些人感到疲憊 (累)。**請指出在過去的二個禮拜內，心臟衰竭（呼吸急促【喘】或疲憊【累】）對您從事下列活動的能力有多少限制**。

請在每行的其中一個☐打 ✓

活動	**嚴重的受限**	**相當的受限**	**中度受限**	**輕微受限**	**一點也沒有受限**	**因其他原因受到限制或沒有從事這項活動**
自己穿衣服	☐	☐	☐	☐	☐	☐
淋浴/盆浴	☐	☐	☐	☐	☐	☐
在平地上走一個路段 (在平地上走一百公尺)	☐	☐	☐	☐	☐	☐
做庭院工作，家事，或拿食品雜貨(買的東西)	☐	☐	☐	☐	☐	☐
爬一段的階梯 (大約半層樓) 不需要停	☐	☐	☐	☐	☐	☐
趕時間或小跑步（如就像去趕搭公車）	☐	☐	☐	☐	☐	☐

2.跟二個禮拜前相比，您的**心臟衰竭**症狀 (呼吸急促[喘]、疲憊[累]或腳踝腫脹[水腫])有改變嗎？
我的**心臟衰竭**症狀變的…

變的更差	稍微變差	沒有改變	稍微變好	好很多	我在過去二個禮拜沒有症狀
☐	☐	☐	☐	☐	☐

3.在過去的二個禮拜，有多少次當您早上醒來時，您的腳板、腳踝或小腿有**腫脹(水腫)**情形？

每天早上	一個禮拜有三次或更多次，但不是每天	一個禮拜一次到二次	一個禮拜少於一次	在過去二個禮拜從沒有過
☐	☐	☐	☐	☐

4.在過去的二個禮拜，您的腳板、腳踝或小腿**腫脹(水腫)**有多困擾您？

我已經有

嚴重的困擾	**相當**的困擾	**中度**困擾	**稍微**困擾	**一點也沒有**困擾	我並**沒有腫脹**
☐	☐	☐	☐	☐	☐

5.在過去的二個禮拜，平均來說，有多少次因爲**疲憊(累)**限制了您的能力去做您想做的事？

所有的時間	一天好幾次	一天至少一次	一個禮拜有三次或更多次，但不是每天	一個禮拜一到二次	一個禮拜少於一次	在過去的二個禮拜從沒有過
☐	☐	☐	☐	☐	☐	☐

6. 在過去的二個禮拜，**疲憊(累)**有多困擾您？

我已經有

嚴重的困擾	**相當**的困擾	**中度**困擾	**稍微**困擾	**一點也沒有**困擾	我並**沒有**疲憊(累)
☐	☐	☐	☐	☐	☐

7. 在過去二個禮拜，平均來說，有多少次因爲**呼吸急促(喘)**限制您的能力去做您想做的事？

所有的時間	一天好幾次	一天至少一次	一個禮拜有三次或更多次，但不是每天	一個禮拜一到二次	一個禮拜少於一次	在過去二個禮拜從沒有過
☐	☐	☐	☐	☐	☐	☐

8. 在過去的二個禮拜，**呼吸急促(喘)**有多困擾您？

我已經有

嚴重的困擾	**相當**的困**擾**	**中度**困擾	**稍微**困擾	**一點也沒有**困擾	我並**沒有呼吸急促(喘)**
☐	☐	☐	☐	☐	☐

9. 在過去的二個禮拜，平均來說，有多少次因爲**呼吸急促(喘)**，您不得不坐在椅子上或用棉被或比平常多的枕頭(例如二個或以上)來支撐您睡覺？

每天晚上	一個禮拜有三次或更多次，但不是每天	一個禮拜一到二次	一個禮拜少於一次	在過去二個禮拜從來都沒有
☐	☐	☐	☐	☐

10. **心臟衰竭**症狀會因許多原因而變嚴重，假使您的**心臟衰竭**變嚴重時，您有多確定您知道要怎麼處理，或打電話給誰？

一點也不確定	**不是很**確定	**一半**確定	**大部分**確定	**完全**確定
☐	☐	☐	☐	☐

11.您有多了解您可以做哪些事來避免您的**心臟衰竭**症狀變嚴重？(例如:秤體重、吃低鹽飲食…等等)

一點也不了解	不是很了解	一半了解	大部分了解	完全了解
☐	☐	☐	☐	☐

12. 在過去的二個禮拜，您的**心臟衰竭**有多限制您享受您的生活？

我的生活享受已經被….

嚴重受到限制	**相當**受到限制	**中度**受到限制	**稍微**受到限制	並**沒有**受到限制
☐	☐	☐	☐	☐

13.假如您的後半輩子都必須與您目前有的**心臟衰竭**狀況相處，您對這樣的狀況滿意嗎？

一點也不滿意	大部分不滿意	一半滿意	大部分滿意	完全滿意
☐	☐	☐	☐	☐

14. 在過去的二個禮拜，您有多常因爲心臟衰竭而感到沮喪或憂鬱？

我**所有的時間**都覺得那樣	我**大部分的時間**覺得那樣	我**有時**覺得那樣	我很少覺得那樣 (只有一到二次)	我**從不**覺得那樣
☐	☐	☐	☐	☐

15.您的**心臟**對您的生活型態影響有多少？請指出在過去二個禮拜，您的心臟衰竭可能對您從事下列活動的限制有多少.

請在每行的其中一個☐打 ✓

活動	**嚴重的**受限	**相當的**受限	**中度**受限	**稍微**受限	**一點也沒有**受限	不適用，或因其他原因或沒有從事這項活動
興趣、休閒活動	☐	☐	☐	☐	☐	☐
工作或做家務	☐	☐	☐	☐	☐	☐
外出拜訪家人或朋友	☐	☐	☐	☐	☐	☐
與親愛的人有親密關係	☐	☐	☐	☐	☐	☐

PSQI (Chinese Version)
夜間睡眠狀況評估

說明：下列問題是要調查您過去這一個月來的睡眠習慣，請您以平均狀況回答以下每一個問題。

1.過去一個月來，您晚上通常幾點睡覺？ _____點 _____分
2.過去一個月來，您在上床後，通常躺多久才能入睡？ _____分
3.過去一個月來，您早上通常幾點起床？ _____點 _____分
4.過去一個月來，您每天晚上真正睡著的時間約多少？ (這可能和您躺在床上所花的時間不同)？_____小時 _____分

下列問題請選擇最適合您的答案，在適合的選項內打勾，並回答所有問題。

	從未發生	每週少於一次	每週 1-2 次	每週 3 次或以上
5. 過去一個月來，您的睡眠有多少次受到下列干擾？ a.無法在 30 分鐘內入睡				
b.半夜或清晨醒來				
c.需要起床上廁所				
d.呼吸不順暢				
e.咳嗽或大聲打鼾				
f.感覺很冷				
g.感覺很熱				
h.作惡夢				
i.疼痛				
j.其他情況請說明:_____。				
6.過去一個月來，您有多少次需要藉助藥物(醫師處方或成藥)來幫助睡眠？				
7.過去一個月來，當您在開車、用餐、從事日常社交活動時，有多少次覺得難以保持清醒狀態？				

	完全沒有困擾	只有很少困擾	有些困擾	有很大困擾
8.過去一個月來，要打起精神來完成您應該做的事情對您有多少困擾？				

	非常好	好	不好	非常不好
9.過去一個月來，您對您自己的睡眠品質整體評價如何？				

您有無室友或睡眠伴侶?

☐沒有室友或睡眠伴侶　　☐室友或睡眠伴侶睡在其他房間

☐與室友或睡眠伴侶睡同一間房間但不同床　　☐與室友或睡眠伴侶共睡一張床

10.如果您有室友或睡眠伴侶，請詢問他 (她) 您過去一個月來睡覺時是否有下列情況發生：

	從未發生	每週少於一次	每週 1-2 次	每週 3 次以上
大聲打鼾				
呼吸暫停				
腿部抽動				
心神混亂				
其他出現於睡眠中不安穩的情況，請描述_____ _____				
此現象發生的頻率爲何?				

Resource:

Tsai, P.-S., Wang, S.-Y., Wang, M.-Y., Su, C.-T., Yang, T.-T., Huang, C.-J., et al. (2005). Psychometric evaluation of the Chinese version of the Pittsburgh Sleep Quality Index (CPSQI) in primary insomnia and control subjects. *Quality of Life Research, 14*, 1943-1952.

ESS (Chinese Version)
白天打瞌睡狀況

請圈選出您最近一段時間內，在以下不同情況中**打瞌睡** (不單只是感覺疲倦)的頻率，若您從未曾有過其中的一些狀況，也請盡量圈選**最接近**的答案:

0:從未 1:很少 2:一半以上 3:幾乎都會

	0	1	2	3
1.坐著閱讀時	0	1	2	3
2.看電視時	0	1	2	3
3.在公眾場合安靜坐著 (如在戲院或會議中)	0	1	2	3
4.坐車連續超過一小時 (不包含自己開車)	0	1	2	3
5.在下午躺下休息時	0	1	2	3
6.坐著與人交談時	0	1	2	3
7.沒有喝酒的情況下, 在午餐後安靜坐著時	0	1	2	3
8.開車或坐車中遇到交通問題而停下數分鐘時	0	1	2	3

ESS v.2 Authority from Dr. Chen, Ning-Hung
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您是否有午睡習慣 □無 □有，若有，一周約幾次:_____

或從下面選項勾選: □每天 □五至六次 □三至四 □一至二次

每次午睡大約多久_____小時_____分鐘

謝謝您的填答！

References

Aaronson, N. K. (1988). Quality of life: What is it? How should it be measured? *Oncology, 2*(5), 69-76.

Aaronson, N. K. (1990). Quality of life research in cancer clinical trials: A need for common rules and language. *Oncology, 4*(5), 59-66.

Acton, G. J. (1994). Well-being as a concept for theory, practice, and research. *The Online Journal of Knowledge Synthesis for Nursing, 1*, Document Number 11.

Adams, K. F., Jr, & Zannad, F. (1998). Clinical definition and epidemiology of advanced heart failure. *American Heart Journal, 135*(6 Pt. 2 Suppl.), S204-S215.

Albrecht, G. L. (1994). Subjective health assessment. In C. Jenkinson (Ed.), *Measuring health and medical outcomes* (pp. 7-26). London: UCL Press.

American Academy of Sleep Medicine. (1999). Sleep-related breathing disorders in adults: Recommendations for syndrome definition and measurement techniques in clinical research. *Sleep, 22*, 667-689.

American Psychiatric Association. (1994). *Diagnosis and Statistical Manual of Mental Disorders* (4th ed.). Washington, DC: American Psychiatric Association.

Ancoli-Israel, S., DuHamel, E. R., Stepnowsky, C., Engler, R., Cohen-Zion, M., & Marler, M. (2003). The relationship between congestive heart failure, sleep apnea, and mortality in older men. *Chest, 124*, 1400-1405.

Armor, D. J. (1973-4). Theta reliability and factor scaling. *Sociological Methodology, 5*, 17-50.

Arnold, R., Ranchor, A. V., Koeter, G. H., de Jongste, M. J. L., & Sanderman, R. (2005). Consequences of chronic obstructive pulmonary disease and chronic heart failure: The relationship between objective and subjective health. *Social Science & Medicine, 61*, 2144-2154.

Asplund, R. (1996). Daytime sleepiness and napping amongst the elderly in relation to somatic health and medical treatment. *Journal of Internal Medicine, 239*, 261-267.

Asplund, R. (2004). Nocturia, nocturnal polyuria, and sleep quality in the elderly. *Journal of Psychosomatic Research, 56*, 517-525.

Asplund, R. (2005). Nocturia in relation to sleep, health, and medical treatment in the elderly. *BJU International, 96*(Suppl 1), 15-21.

Aurigemma, G. P., & Gaasch, W. H. (2004). Diastolic heart failure. *The New England Journal of Medicine, 351*, 1097-1105.

Baldwin, C. M., Griffith, K. A., Nieto, F. J., O'Connor, G. T., Walsleben, J. A., & Redline, S. (2001). The association of sleep-disordered breathing and sleep symptoms with quality of life in the Sleep Heart Health Study. *Sleep, 24*, 96-105.

Banerjee, P., Banerjee, T., Khand, A., Clark, A. L., & Cleland, J. G. F. (2002). Diastolic heart failure: neglected or misdiagnosed? *Journal of the American College of Cardiology, 39*, 138-141.

Barbette, E., Guillemin, F., Chau, N., & the L orhandicap Group. (2001). Prevalence of impairments, disabilities, handicaps and quality of life in the general population: a review of recent literature. *Bulletin of the World Health Organization, 79*, 1047-1055.

Bell, D. S. H. (2003). Heart failure: The f requent, forgotten, and often fatal complication of diabetes. *Diabetes Care, 26*, 2433-2441.

Bennett, S. J., Baker, S. L., & Huster, G. A. (1998). Quality of life in women with heart failure. *Health Care for Women International, 19*, 217-229.

Bennett, S. J., Cordes, D. K., Westmoreland, G., Castro, R., & Donnelly, E. (2000). Self-care strategies for symptom management in patients with chronic heart

failure. *Nursing Research, 49*, 139-145.

Bennett, S. J., Hays, L., M., Embree, J. L., & Arnould, M. (2000). Heart messages: A tailored message intervention for improving heart failure outcomes. *Journal of Cardiovascular Nursing, 14*(4), 94-105.

Bennett, S. J., Oldridge, N. B., Eckert, G. J., Embree, J. L., Browning, S., Hou, N., et al. (2003). Comparison of quality of life measures in heart failure. *Nursing Research, 52*, 207-216.

Berkowitz, R., Blank, L. J., & Powell, S. K. (2005). Strategies to reduce hospitalization in the management of heart failure. *Lippincott's Case Management, 10*(6S), S1-S17.

Berry, C., & McMurray, J. (1999). A review of quality-of-life evaluations in patients with congestive heart failure. *PharmacoEconomics, 16*, 247-271.

Berzon, R. (1998). Understanding and using health-related quality of life instruments within clinical research studies. In M. Staquet, R. Hays & P. Fayers (Eds.), *Quality of life assessment in clinical trials methods and practice* (pp. 3-15). New York: Oxford University Press.

Bixler, E. O., Vgontzas, A. N., Lin, H. M., Calhoun, S. L., Vela-Bueno, A., & Kales, A. (2005). Excessive daytime sleepiness in a general population sample: The role of sleep apnea, age, obesity, diabetes, and depression. *The Journal of Clinical Endocrinology and Metabolism, 90*, 4510-4515.

Bootzin, R., Lahmeyer, H., Lilie, K., Hanawalt, A., & Shaver, J. (1994) . *Integrated approach to sleep management: The healthcare practitioner's guide to the diagnosis and treatment of sleep disorders*. Belle Mead, NJ: Cahners Healthcare Communications.

Bosworth, H. B., Steinhauser, K. E., Orr, M., Lindquist, J. H., Grambow, S. C., & Oddone, E. Z. (2004). Congestive heart failure patients' perceptions of quality of life: The

integration of physical and psychosocial factors. *Aging & Mental Health, 8*, 83-91.

Bowling, A. (2003). Current state of the art in quality of life measureme nt. In A. J. Carr, I. J. Higginson & P. G. Robinson (Eds.), *Quality of Life* (pp. 1-8). London: BMJ Book.

Braunstein, J. B., Anderson, G. F., Gerstenblith, G., Weller, W., Niefeld, M., Herbert, R., et al. (2003). Noncardiac comorbidity increases preventable hospitalizations and mortality among medicare beneficiaries with chronic heart failure. *Journal of American College of Cardiology, 42*, 1226-1233.

Braunwald, E. (1997). *Heart disease a textbook of cardiovascular medicine* (5th ed.). Philadelphia, PA: W.B. Saunders.

Brink, P. J., & Woo, M. J. (2001). *Basic steps in planning nursing research*. Mississauga, Ontario, Canada: Johns & Bartlett.

Brostrom, A., Hubbert, L., Jakobsson, P., Johansson, P., Fridlund, B., & Dahlstrom, U. (2005). Effects of long-term nocturnal oxygen treatment in patients with severe heart failure. *Journal of Cardiovascular Nursing, 20*, 385-395.

Brostrom, A., & Johansson, P. (2005). Sleep disturbances in patients with chronic heart failure and their holistic consequences--what different care actions can be implemented? *European Journal of Cardiovascular Nursing, 4*, 183-197.

Brostrom, A., Stromberg, A., Dahlstrom, U., & Fridlund, B. (2001). Patients with congestive heart failure and their conceptions of their sleep situation. *Journal of Advanced Nursing, 34*, 520-529.

Brostrom, A., Stromberg, A., Dahlstrom, U., & Fridlund, B. (2004). Sleep difficulties, daytime sleepiness, and health-related quality of life in patients with chronic heart failure. *Journal of Cardiovascular Nursing, 19*, 234-242.

Bursi, F., Weston, S. A., Redfield, M. M., Jacobsen, S. J., Pakhomov, S., Nkomo, V. T., et al. (2006). Systolic and diastolic heart failure in the community. *JAMA: Journal of the American Medical Association, 296*, 2209-2216.

Buysse, D. J., Reynolds, Ⅲ. C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. *Psychiatry Research, 28*, 193-213.

Cacciatore, F., Abete, P., Ferrara, N., Calabrese, C., Napoli, C., Maggi, S ., et al. (1998). Congestive heart failure and cognitive impairment in an older population. *Journal of the American Geriatrics Society, 46*, 1343-1348.

Calman, K. (1987). Definitions and dimensions of quality of life. In N. K. Aaronson & J. Beckmann (Eds.), *The quality of life of cancer patients* (pp. 1-9). New York: Raven Press.

Caples, S. M., Gami, A. S., & Somers, V. K. (2005). Obstructive sleep apnea. *Annals of Internal Medicine, 142*, 187-197.

Carelock, J., & Clark, A. P. (2001). Heart failure: Pathophysi ologic mechanisms. *American Journal of Nursing, 101* (12), 26-33.

Carels, R. A. (2004). The association between disease severity, functional status, depression and daily quality of life in congestive heart failure patients. *Quality of Life Research, 13*, 63-72.

Carlson, B., Riegel, B., & Moser, D. K. (2001). Self -care abilities of patients with heart failure. *Heart & Lung, 30*, 351-359.

Carr, A. J., Gibson, B., & Robinson, P. G. (2001). Measuring quality of life: Is quality of life determined by expectations or experience? *BMJ, 322*, 1240-1243.

Charlson, M. E., Pompei, P., Ales, K. L., & MacKenzie, C. R. (1987). A new method of classifying prognostic comorbidity in longitudinal studies: Development and

validation. *Journal of Chronic Diseases, 40*, 373-383.

Chen, L. H. (2004). *Relationship between symptomatic distress, psychological distress, social support and fatigue in patients with heart failure.* Unpublished thesis, Fu Jen Catholic University, Taipei.

Chen, L. W., Chiang, C. E., & Lin, S. J. (2005). Newest treat ment in chronic heart failure--2005 US and Europe Heart Associations updated guidelines. *Clinical Medicine 16*, 439-444.

Chen, M.-C., Chang, H.-W., Cheng, C.-I., Chen, Y.-H., & Chai, H.-T. (2003). Risk stratification of in-hospital mortality in patients hos pitalized for chronic congestive heart failure secondary to non-ischemic cardiomyopathy. *Cardiology, 100*, 136-142.

Chen, N.-H., Johns, M. W., Li, H.-Y., Chu, C.-C., Liang, S.-C., Shu, Y.-H., et al. (2002). Validation of a Chinese version of the Epworth sle epiness scale. *Quality of Life Research, 11*, 817-821.

Chen, Y., Kawachi, I., Subramanian, S., Acevedo-Garcia, D., & Lee, Y. (2005). Can social factors explain sex differences in insomnia? Findings from a national survey in Taiwan. *Journal of Epidemiology and Community Health, 59*, 488-494.

Cheng, A. T., Tien, A. Y., Chang, C. J., Brugha, T. S., Cooper, J. E., Lee, C. S., et al. (2001). Cross-cultural implementation of a Chinese version of the Schedules for Clinical Assessment in Neuropsychiatry (SCAN) in Tai wan. *The British Journal of Psychiatry, 178*, 567-572.

Cheng, C.-Y. (2006). *Stress, social support, and health status of Chinese postpartum mothers.* Unpublished Dissertation, The University of Texas at Austin, Austin.

Cheng, H.-H. (2004). *The relationships between perceived dyspnea, depression, fatigue and the quality of life in patients with congestive heart failure.* Unpublished thesis,

National Taipei Nursing College, Taipei.

Chin, M. H., Zhang, J. X., & Rathouz, P. J. (2003). Transitions in health status in older patients with heart failure. *Southern Medical Journal, 96*, 1096-1106.

Clark, A. P., & McDougall, G. (2006). Cognitive impairment in heart failure. *Dimensions of Critical Care Nursing, 25*, 93-100.

Clark, D. O., Tu, W., Weiner, M., & Murray, M. D. (2003). Correlates of health-related quality of life among lower-income, urban adults with congestive heart failure. *Heart & Lung, 32*, 391-401.

Cline, C. M., Willenheimer, R. B., Erhardt, L. R., Wiklund, I., & Israelsson, B. Y. (1999). Health-related quality of life in elderly patients with heart failure. *Scandinavian Cardiovascular Journal, 33*, 278-285.

Coelho, R., Ramos, S., Prata, J., Bettencourt, P., Ferreira, A., & Cerqueira -Gomes, M. (2005). Heart failure and health related quality of life. *Clinical Practice and Epidemiology in Mental Health, 1*, 19.

Cohen, J. (1988). *Statistical power analysis for the behavioral science* . Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Cooley, M. (1998). Quality of life in persons with non -small cell lung cancer: A concept analysis. *Cancer Nursing, 21*, 151-161.

Cormican, L. J., & Williams, A. (2005). Sleep disordered breathing and its treatment in congestive heart failure. *Heart, 91*, 1265-1270.

D'Hoore, W., Bouckaert, A., & Tilquin, C. (1996). Practical considerations on the use of the charlson comorbidity index with administrative data bases. *Journal of Clinical Epidemiology, 49*, 1429-1433.

Dantzer, R., & Kelley, K. W. (2007). Twenty years of research on cytokine -induced sickness behavior. *Brain, Behavior, And Immunity, 21*, 153-160.

De Jong, M., Moser, D. K., & Chung, M. L. (2005). Predictors of health status for heart failure patients. *Progress in Cardiovascular Nursing, 20*, 155-162.

De Keulenaer, G. W., & Brutsaert, D. L. (2007). Diastolic heart failure: A separate disease or selection bias? *Progress in Cardiovascular Diseases, 49*, 275-283.

Dement, W. C. (2005). Sleep extension: Getting as much extra sleep as possible. *Clinics in Sports Medicine, 24*, 251-268.

Deyo, R. A., Cherkin, D. C., & Ciol, M. A. (1992). Adapting a clinical comorbidity index for use with ICD-9-CM administrative databases. *Journal of Clinical Epidemiology, 45*, 613-619.

Deyo, R. A., Diehr, P., & Patrick, D. L. (1991). Reproducibility and responsiveness of health status measures. Statistics and strategies for evaluation. *Controlled Clinical Trials, 12*(4 Suppl.), 142S-158S.

Dijkers, M. (1999). Measuring quality of life: Methodological issues. *American Journal of Physical Medicine & Rehabilitation., 78*, 286-300.

Dobre, D., van Jaarsveld, C. H. M., Ranchor, A. V., Arnold, R., de Jongste, M. J. L., & Haaijer Ruskamp, F. M. (2006). Evidence-based treatment and quality of life in heart failure. *Journal of Evaluation in Clinical Practice, 12*, 334-340.

Edelll-Gustaffson, U. M. (2002). Insufficient sleep, cognitive anxiety and health transition in men with coronary artery disease: a self-report and polysomnographic study. *Journal of Advanced Nursing, 37*, 414-422.

Ekman, I., Fagerberg, B., & Lundman, B. (2002). Health-related quality of life and sense of coherence among elderly patients with severe chronic heart failure in comparison with healthy controls. *Heart & Lung, 31*, 94-101.

Encyclopædia Britannica. (2007). Connective tissue disease: Encyclopædia Britannica.

Erickson, P. (2000). Assessment of the evaluative properties of health status instruments.

Medical Care, 38(9 Suppl.), II95-99.

Erickson, V. S., Westlake, C. A., Dracup, K. A., Woo, M. A., & Hage, A. (2003). Sleep disturbance symptoms in patients with heart failure. *AACN Clinical Issues Advanced Practice in Acute & Critical Care, 14*, 477-487.

Farquhar, M. (1995). Definitions of quality of life: A taxonomy. *Journal of Advanced Nursing, 22*, 502-508.

Fayers, P., & Machin, D. (2000). *Quality of life assessment, analysis, and interpretation.* Chichester: John Wiely & Sons.

Feldman, P., Peng, T., Murtaugh, C., Kelleher, C., Donelson, S., McCann, M., et al. (2004). A randomized intervention to improve heart failure outcomes in community-based home health care. *Home Health Care Services Quarterly, 23*, 1-23.

Ferketich, S. (1991). Focus on psychometrics aspects of item analysis. *Research in Nursing & Health, 14*, 165-168.

Ferrans, C. E. (1996). Development of a conceptual model of quality of life. *Scholarly Inquiry for Nursing Practice, 10*, 293-304.

Ferrans, C. E., & Powers, M. J. (1985). Quality of life index: development and psychometric properties. *Advances in Nursing Science, 8*, 15-24.

Ferrans, C. E., Zerwic, J. J., Wilbur, J. E., & Larson, J. L. (2005). Conceptual model of health-related quality of life. *Journal of Nursing Scholarship, 37*, 336-342.

Flaherty, J. A., Gaviria, F. M., Pathak, D., Mitchell, T., Wintrob, R., Richman, J. A., et al. (1988). Developing instruments for cross-cultural psychiatric research. *The Journal of Nervous and Mental Disease, 176*, 257-263.

Ford, D. E., & Cooper-Patrick, L. (2001). Sleep disturbances and mood disorders: An epidemiologic perspective. *Depression and Anxiety, 14*, 3-6.

Fox-Rushby, J., & Parker, M. (1995). Culture and the measurement of health -related quality of life. *European Review of Applied Psychology, 45*, 257-263.

Francis, G. (2006). Acute decompensated heart failure: The cardiorenal syndrome. *Cleveland Clinic Journal of Medicine, 73* (Suppl. 2), S8-S13.

Francis, G. S., & Tang, W. H. W. (2003). Pathophysiology of congestive h eart failure. *Reviews in Cardiovascular Medicine, 4* (Suppl. 2), S14-S20.

Friedman, M. M. (2003). Gender differences in the health related quality of life of older adults with heart failure. *Heart & Lung, 32*, 320-327.

Fukuta, H., & Little, W. C. (2007). Cont ribution of systolic and diastolic abnormalities to heart failure with a normal and a reduced ejection fraction. *Progress in Cardiovascular Diseases, 49*, 229-240.

Gander, P. H., Marshall, N. S., Harris, R., & Reid, P. (2005). The Epworth Sleepiness Scale: Influence of age, ethnicity, and socioeconomic deprivation. Epworth Sleepiness scores of adults in New Zealand. *Sleep, 28*, 249-253.

Ganong, W. E. (1999). The heart as a pump. In W. E. Ganong (Ed.), *Review of medical physiology* (19th ed., pp. 539-549). Stamford, Connecticut: Appleton & Lange.

Gheorghiade, M., De Luca, L., Fonarow, G. C., Filippatos, G., Metra, M., & Francis, G. S. (2005). Pathophysiologic targets in the early phase of acute heart failure syndromes. *The American Journal of Cardiology, 96* (6, Supp. 1), 11-17.

Gott, M., Barnes, S., Parker, C., Payne, S., Seamark, D., Gariballa, S., et al. (2006). Predictors of the quality of life of older people with heart failure recruited from primary care. *Age And Ageing, 35*, 172-177.

Grady, K. L., Jalowiec, A., & White-Williams, C. (1996). Improvement in quality of life in patients with heart failure who undergo transplantation. *The Journal of Heart and Lung Transplantation, 15*, 749-757.

Green, C. P., Porter, C. B., Bresnahan, D. R., & Spertus, J. A. (2000). D evelopment and evaluation of the Kansas City Cardiomyopathy Questionnaire: A new health status measure for heart failure. *Journal of the American College of Cardiology, 35*, 1245-1255.

Greenberg, B. (2002). Slowing heart failure progression: Optimal treatme nt of mild heart failure. *Hospital Physician, 38*, 43-49.

Guyatt, G. H. (1987). Use of the six-minute walk test as an outcome measure in clinical trials in chronic heart failure. *Heart Failure, 3*, 211-217.

Guyatt, G. H., Feeny, D. H., & Patrick, D. L. (1993). Measuring health--related quality of life. *Annals of Internal Medicine, 118*, 622-629.

Guyatt, G. H., Nogradi, S., Halcrow, S., Singer, J., Sullivan, M. J., & Fallen, E. L. (1989). Development and testing of a new measure of health status for clinical tr ials in heart failure. *Journal of General Internal Medicine, 4*, 101-107.

Haas, B. K. (1999). A multidisciplinary concept analysis of quality of life. *West Journal of Nursing Research, 21*, 728-742.

Hadorn, D., Baker, D., Dracup, K., & Pitt, B. (1994). Makin g judgments about treatment effectiveness based on health outcomes: Theoretical and practical issues. *Joint Commission Journal on Quality Improvement, 20*, 547-554.

Hagenhoff, B. D., Feutz, C., Conn, V. S., Sagehorn, K. K., & Moranville -Hunziker, M. (1994). Patient education needs as reported by congestive heart failure patients and their nurses. *Journal of Advanced Nursing, 19*, 685-690.

Harvard Medical School. (2006). Six for 2006: six reasons not to scrimp on sleep. *Harvard Women's Health Watch, 13*(5), 1-3.

Hauptman, P. J., Masoudi, F. A., Weintraub, W. S., Pina, I., Jones, P. G., & Spertus, J. A. (2004). Variability in the clinical status of patients with advanced heart failure.

Journal of Cardiac Failure, 10, 397-402.

Havranek, E. P., Lapuerta, P., Simon, T. A., L'Italien, G., Block, A. J., & Rouleau, J. L. (2001). A health perception score predicts cardiac events in patients with heart failure: Results from the IMPRESS trial. *Journal of Cardiac Failure, 7*, 153-157.

Havranek, E. P., Masoudi, F. A., Rumsfeld, J. S., & Steiner, J. F. (2003). A broader paradigm for understanding and treating heart failure. *Journal of Cardiac Failure, 9*, 147-152.

Havranek, E. P., Spertus, J. A., Masoudi, F. A., Jones, P. G., & Rumsfeld, J. S. (2004). Predictors of the onset of depressive symptoms in patients with heart failure. *Journal of the American College of Cardiology, 44*, 2333-2338.

Hawthorne, M. H., & Hixon, M. E. (1994). Functional status, mood disturbance and quality of life in patients with heart failure. *Progress in Cardiovascular Nursing, 9*, 22-32.

Heart Failure Society of America. (2006). Conceptualization and working definition of heart failure. *Journal of Cardiac Failure, 12*(1), e10-11.

Heidenreich, P. A., Spertus, J. A., Jones, P. G., Weintraub, W. S., Rumsfeld, J. S., Rathore, S. S., et al. (2006). Health status identifies heart failure outpatients at risk for hospitalization or death. *Journal of the American College of Cardiology, 47*, 752-756.

Heo, S., Moser, D. K., Riegel, B., Hall, L. A., & Christman, N. (2005). Testing a published model of health-related quality of life in heart failure. *Journal of Cardiac Failure, 11*, 372-379.

Herdman, M., Fox-Rushby, J., & Badia, X. (1998). A model of equivalence in the cultural adaptation of HRQoL instruments: The universalist approach. *Quality of Life Research, 7*, 323-335.

Hershberger, R. E., Ni, H., Nauman, D. J., Burgess, D., Toy, W., Wise, K., et al. (2001). Prospective evaluation of an outpatient heart failure management program. *Journal of Cardiac Failure, 7*, 64-74.

Ho, W.-J., Tsay, P.-K., Chu, P.-H., Chang, C.-J., Kuo, C.-T., & Chen, W.-J. (2004). Predictors of stable outcome in treating chronic heart failure patients with carvedilol. *Japanese Heart Journal, 45*, 823-832.

Hoddes, E., Zarcone, V., Smythe, H., Phillips, R. , & Dement, W. C. (1973). Quantification of sleepiness: A new approach. *Psychophysiology, 10*, 431-436.

Hodgson, L. A. (1991). Why do we need sleep? Relating theory to nursing practice. *Journal of Advanced Nursing, 16*, 1503-1510.

Holbrook, A. M., Crowther, R., Lotter, A., Cheng, C., & King, D. (2000). The diagnosis and management of insomnia in clinical practice: A practical evidence -based approach. *CMAJ, 162*, 216-220.

Hong, S.-J. (2005). *Factors contributing to daytime sleep behavior and its relationship with quality of sleep in institutional elderly people.* Unpublished thesis, Fooyin University, Kaohsiung.

Hou, N., Chui, M. A., Eckert, G. J., Oldridge, N. B., Murray, M. D., & Bennett, S. J. (2004). Relationship of age and sex to health -related quality of life in patients with heart failure. *American Journal of Critical Care, 13*, 153-161.

Hsu, C. H., Chang, K. C., Pai, P. Y., Lo, P. H., & Ling, Y. -C. (2006). Cardiac resynchronization therapy in congestive heart failure also provides beneficial effects for rhythm Control of atrial fibrillation *Mid-Taiwan Journal of Medicine 11*, 50-55.

Hu, P., Adler, N. E., Goldman, N., Weinstein, M., & Seeman, T. E. (2005). Relationship between subjective social status and measures of health in older Taiwanese

persons. *Journal of the American Geriatrics Society, 53*, 483-488.

Huang, C.-M., Carter, P. A., & Guo, J.-L. (2004). A comparison of sleep and daytime sleepiness in depressed and non-depressed mothers during the early postpartum period. *Journal of Nursing Research, 12*, 287-295.

Huang, K. C., Pan, W. H., Lee, M. S., & Change, Y. H. (2006, Novmenber 8). Prevalence of overweight and obesity in the elderly (老年人過重與肥胖之盛行狀況). Retrieved Febrary 19, 2006, from http://food.doh.gov.tw/chinese/academic/academic3_1.htm

Huck, S. W. (2004). *Reading statistics and research* (4 ed.). Boston, MA: Pearson.

Hung, Y. T., Cheung, N. T., Ip, S., & Fung, H. (2000). Epidemiology of heart failure in Hong Kong, 1997. *Hong Kong Medical Journal, 6*, 159-162.

Hunt, S. A., Abraham, W. T., Chin, M. H., Feldman, A. M., Francis, G. S., Ganiats, T. G., et al. (2005). ACC/AHA 2005 guideline update for the diagnosis and management of chronic heart failure in the adult. *Circulation, 112*, e154-235.

Hunt, S. A., Baker, D. W., Chin, M. H., Cinquegrani, M. P., Feldmanmd, A. M., Francis, G. S., et al. (2001). ACC/AHA guidelines for the evaluation and management of chronic heart failure in the adult: Executive summary a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (committee to revise the 1995 guidelines for the evaluation and management of heart failure): Developed in collaboration with the International Society for Heart and Lung Transplantation; endorsed by the Heart Failure Society of America. *Circulation, 104*, 2996-3007.

Hunt, S. M., McKenna, S. P., McEwen, J., Backett, E. M., Williams, J., & Papp, E. (1980). A quantitative approach to perceived health status: A validation study. *Journal of Epidemiology and Community Health, 34*, 281-286.

Hussey, L. C., & Hardin, S. (2003). Sex-related differences in heart failure. *Heart & Lung, 32*, 215-223.

Hutcheson, G. D., & Sofroniou, N. (1999). *Introductory statistics using generalized linear models*. Thousand Oaks, CA: SAGE Publications.

Hwu, Y. J., Coates, V. E., & Boore, J. R. (2001). The health behaviours of Chinese people with chronic illness. *International Journal of Nursing Studies, 38*, 629-641.

Jaarsma, T., Halfens, R., Abu-Saad, H. H., Dracup, K., Stappers, J., & van Ree, J. (1999). Quality of life in older patients with systolic and diastolic heart failure. *European Journal of Heart Failure, 1*, 151-160.

Jahaveri, S., Parker, T. J., Wexler, L., Michaels, S., Stanberry, E., Nishyama, H., et al. (1995). Occult sleep-disordered breathing in stable congestive heart failure. *Annals of Internal Medicine, 122*, 487-492.

Jalowiec, A., & Grady, K. L. (1994). Stressors in patients awaiting a heart transplant. *Behavioral Medicine, 94*, 145-155.

Javaheri, S. (2006). Sleep disorders in systolic heart failure: a prospective study of 100 male patients. The final report. *International Journal of Cardiology, 106*, 21-28.

Jenkinson, C. (1994). Measuring health and medical outcomes: An overview. In C. Jenkinson (Ed.), *Measuring health and medical outcomes* (pp. 1-6). London: UCL Press.

Jessup, M., & Brozena, S. (2003). Heart failure. *The New England Journal of Medicine, 348*, 2007-2018.

Jiang, W., Alexander, J., Christopher, E., Kuchibhatla, M., Gaulden, L. H., Cuffe, M. S., et al. (2001). Relationship of depression to increased risk of mortality and rehospitalization in patients with congestive heart failure. *Archives of Internal Medicine, 161*, 1849-1856.

Jobe, J. B., & Mingay, D. J. (1989). Cognitive Research Improves Questionnaires. *American Journal of Public Health, 79*, 1053-1055.

Johansson, P., Agnebrink, M., Dahlstrom, U., & Brostrom, A. (2004). Measurement of health-related quality of life in chronic heart failure, from a nursing perspective -a review of the literature. *European Journal of Cardiovascular Nursing, 3*, 7-20.

Johansson, P., Dahlstrom, U., & Brostrom, A. (2006). Factors and int erventions influencing health-related quality of life in patients with heart failure: A review of the literature. *European Journal of Cardiovascular Nursing, 5*, 5-15.

Johns, M. W. (1991). A new method for measuring daytime sleepiness: The Epworth Sleepiness Scale. *Sleep, 14*, 540-545.

Johns, M. W. (1992). Reliability and factor analysis of the Epworth Sleepiness Scale. *Sleep, 15*, 376-381.

Johnson, R. J., & Wolinsky, F. D. (1993). The structure of health status among older adults: Disease, disability, functio nal limitation, and perceived health. *Journal of Health and Social Behavior, 34*, 105-121.

Juarez, G., Ferrell, B., & Borneman, T. (1998). Influence of culture on cancer pain management in Hispanic patients. *Cancer Practice, 6*, 262-269.

Juenger, J., Schellb erg, D., Kraemer, S., Haunstetter, A., Zugck, C., Herzog, W., et al. (2002). Health related quality of life in patients with congestive heart failure: Comparison with other chronic diseases and relation to functional variables. *Heart, 87*, 235-241.

Kasper, E. (2003). What's new in the ACC/AHA guidelines for the evaluation and management of chronic heart failure in adults. *Advanced Studies in Medicine, 3*, 14-21.

Katz, D. A., & McHorney, C. A. (2002). The relationship between insomnia and

health-related quality of life in patients with chronic illness. *Journal of Family Practice, 51*, 229-235.

Katz, J. N., Chang, L. C., Sangha, O., Fossel, A. H., & Bates, D. W. (1996). Can comorbidity be measured by questionnaire rather than medical record review? *Medical Care, 34*, 73-84.

Kerr, M. J., Lusk, S. L., & Ronis, D. L. (2002). Explaining Mexican American workers' hearing protection use with the health promotion model. *Nursing Research, 51*, 100-109.

Kind, P. (1996). The EuroQOL instrument: An index of health -related quality of life. In B. Spilker (Ed.), *Quality of life and pharmacoeconomics in clinical trials* (2nd ed., pp. 191-201). Philadelphia: Lippincott-Raven.

Kitzman, D., Little, W., Brubaker, P., Anderson, R., Hundley, W., Marburger, C., et al. (2002). Pathophysiological characterization of isolated diastolic heart failure in comparison to systolic heart failure. *JAMA: Journal of the American Medical Association, 288*, 2144-2150.

Kleinpell, R. M. (1991). Concept analysis of quality of life. *Dimensions of Critical Care Nursing, 10*, 223-229.

Kohnlein, T., Welte, T., Tan, L. B., & Elliott, M. W. (2002). Central sleep apnoea syndrome in patients with chronic heart disease: A critical review of the current literature. *Thorax, 57*, 547-554.

Kripke, D. F., Garfinkel, L., Wingard, D. L., Klauber, M. R., & Marler, M. R. (2002). Mortality associated with sleep duration and insomnia. *Archives of General Psychiatry, 59*, 131-136.

Lackey, J. (2004). Cognitive impairment and congestive heart failure. *Nursing Standard, 18*, 33-36.

Lai, H.-L. (2005). Self-reported napping and nocturnal sleep in Taiwanese elderly insomniacs. *Public Health Nursing, 22*, 240-247.

Lai, H.-L., & Good, M. (2006). Music improves sleep quality in older adults. *Journal of Advanced Nursing, 53*, 134-144.

Lai, K.-L., Tzeng, R.-J., Wang, B.-L., Lee, H.-S., Amidon, R. L., & Kao, S. (2005). Health-related quality of life and health utility for the institutional elderly in Taiwan. *Quality of Life Research, 14*, 1169-1180.

Lainscak, M., & Keber, I. (2003). Patient's view of heart failure: From the understanding to the quality of life. *European Journal of Cardiovascular Nursing, 2*, 275-281.

Lam, C. L., & Lauder, I. J. (2000). The impact of chronic diseases on the health-related quality of life (HRQOL) of Chinese patients in primary care. *Family Practice, 17*, 159-166.

Lanfranchi, P. A., & Somers, V. K. (2003). Sleep-disordered breathing in heart failure: Characteristics and implications. *Respiratory Physiology & Neurobiology, 136*, 153-165.

Lange, J. (2002). Methodological concerns for non-Hispanic investigators conducting research with Hispanic Americans. *Research in Nursing and Health, 25*, 411-419.

Lauderdale, D. S., Knutson, K. L., Yan, L. L., Rathouz, P. J., Hulley, S. B., Sidney, S., et al. (2006). Objectively measured sleep characteristics among early-middle-aged adults. *American Journal of Epidemiology, 164*, 5-16.

Lawton, M. P., Moss, M., Fulcomer, M., & Kleban, M. H. (1982). A research and service oriented multilevel assessment instrument. *Journal of Gerontology, 37*, 91-99.

Lee, F.-H., & Wang, H.-H. (2005). A prelimary study of a health-promoting lifestyle among South Asian women in Taiwan. *The Kaohsiung Journal of Medical Sciences, 21*, 114-120.

Lee, Y. J. (1995). Sleep disorders in Chinese culture: Experiences from a study o f insomnia in Taiwan. *Psychiatry and Clinical Neurosciences, 49*, 103-106.

Lee, Y. J. (2006). 十年一覺「睡眠醫學」夢 [The 10 years of dreams for「somnology.」] [Electronic Version]. Retrieved June 17, 2006 from http://fma.mc.ntu.edu.tw/medicial_data/taiwan03.htm#01.

Leidy, N. K., Rentz, A. M., & Zyczynski, T. M. (1999). Evaluating health -related quality-of-life outcomes in patients with congestive heart failure: A review of recent randomised controlled trials. *PharmacoEconomics, 15*, 19-46.

Leung, K.-K., Wu, E.-C., Lue, B.-H., & Tang, L.-Y. (2004). The use of focus groups in evaluating quality of life components among elderly Chinese people. *Quality of Life Research, 13*, 179-190.

Leung, R. S. T., & Bradley, T. D. (2001). Sleep apnea and cardiovascular disease. *American Journal of Respiratory and Critical Care Medicine, 164* , 2147-2165.

Levine, R. E., Fowler, F. J., Jr., & Brown, J. A. (2005). Role of cognitive testing in the development of the CAHPS Hospital Survey. *Health Services Research, 40*, 2037-2056.

Levy, D., Kenchaiah, S., Larson, M. G., Benjamin, E. J., Kupka, M. J., Ho, K. K. L., et al. (2002). Long-term trends in the incidence of and survival with heart failure. *The New England Journal of Medicine, 347*, 1397-1402.

Lewis, E. F., Johnson, P. A., Johnson, W., Collins, C., Griffin, L., & Stevenson, L. W. (2001). Preferences for quality of life or survival expressed by patients with heart failure. *The Journal of Heart and Lung Transplantation, 20* , 1016-1024.

Li, H.-Y. (2004). Mood improvement after surgery for obstructive sleep apnea. *Laryngoscope, 114*, 1098-1102.

Li, H.-Y., Chen, N.-H., Shu, Y.-H., & Wang, P.-C. (2004). Changes in quality of life and

respiratory disturbance after extended uvulopalatal flap surgery in patients with obstructive sleep apnea. *Archives of Otolaryngology--Head & Neck Surgery, 130*, 195-200.

Li, H.-Y., Wang, P.-C., Hsu, C.-Y., Chen, N.-H., & Fang, T.-J. (2005). Changes of sleep-disordered breathing after laryngeal surgery in patients with bilateral vocal fold paralysis. *European Archives of Oto-Rhino-Laryngology, 262*, 294-297.

Li, I., Chen, Y., & Kuo, H. (2005). The health status and health promotion behavior of low-income elderly in the Taipei area. *Journal of Nursing Research, 13*, 305-311.

Liao, L., Jollis, J. G., Anstrom, K. J., Whellan, D. J., Kitzman, D. W., Aurigemma, G. P., et al. (2006). Costs for heart failure with normal vs. reduced ejection fraction. *Archives of Internal Medicine, 166*, 112-118.

Lin, C.-L. (2000). *The quality of sleep and its related factors in the self-paid institutionalization elderly.* Unpublished thesis, National Taiwan University, Taipei, Taiwan.

Lin, T., Chou, P., Tsai, S.-T., Lee, Y.-C., & Tai, T.-Y. (2004). Predicting factors associated with costs of diabetic patients in Taiwan. *Diabetes Research and Clinical Practice, 63*, 119-125.

Lloyd-Jones, D. M., Larson, M. G., Leip, E. P., Beiser, A., D'Agostino, R. B., Kannel, W. B., et al. (2002). Lifetime risk for developing congestive heart failure: The Framingham Heart Study. *Circulation, 106*, 3068-3072.

Lu, R. J.-F., Tseng, H.-M., & Tsai, Y.-J. (2003). Assessment of health-related quality of life in Taiwan (I): Development and psychometric testing of SF-36 Taiwan version. *Taiwan Journal of Public Health, 22*, 501-511.

Lu, T.-H., Hsu, P.-Y., Anderson, R. N., & Huang, C.-N. (2005). Mortality and causes of death in a national sample of diabetic patients in Taiwan: Response to Tseng.

Diabetes Care, 28, 1266-1267.

Lusk, S. L., Ronis, D. L., & Kerr, M. J. (1995). Predictors of hearing protection use among workers: Implications for training programs. *Human Factors, 37*, 635-640.

Luthi, J.-C., McClellan, W. M., Flanders, W. D., Pitts, S. R., & Burnand, B. (2006). Variations in quality of care for heart failure. *Swiss Medical Weekly, 136*, 268-273.

Luttik, M. L., Jaarsma, T., Veeger, N., & van Veldhuisen, D. J. (2006). Marital status, quality of life, and clinical outcome in patients with heart failure. *Heart & Lung, 35*, 3-8.

Macabasco-O'Connell, A., Rasmusson, K., & Fiorini, D. (2006). Update on heart failure management. Heart failure update 2006: integrating the latest guidelines into clinical practice. *Progress in Cardiovascular Nursing, 21*, 39-43.

Mann, D. L. (1999). Mechanisms and models in heart failure: A combinatorial approach. *Circulation, 100*, 999-1008.

Manocchia, M., Keller, S., & Ware, J. E. (2001). Sleep problems, health -related quality of life, work functioning and health care utilization among the chronically ill. *Quality of Life Research, 10*, 331-345.

Mansfield, D., Kaye, D. M., Brunner La Rocca, H., Solin, P., Esler, M. D., & Naughton, M. T. (2003). Raised sympathetic nerve activity in heart failure and central sleep apnea is due to heart failure severity. *Circulation, 107*, 1396-1400.

Mansfield, D. R., Gollogly, N. C., Kaye, D. M., Richardson, M., Bergin, P., & Naughton, M. T. (2004). Controlled trial of continuous positive airway pressure in obstructive sleep apnea and heart failure. *American Journal of Respiratory and Critical Care Medicine, 169*, 361-366.

Masoudi, F. A., Havranek, E. P., & Krumholz, H. M. (2002). The burden of chronic congestive heart failure in older persons: magnitude and implications for policy

and research. *Heart Failure Reviews, 7*, 9-16.

Masoudi, F. A., Rumsfeld, J. S., Havranek, E. P., House, J. A., Peterson, E. D., Krumholz, H. M., et al. (2004). Age, functional capacity, and health -related quality of life in patients with heart failure. *Journal of Cardiac Failure, 10*, 368-373.

McAlister, F. A., Stewart, S., Ferrua, S., & McMurray, J. J. J. V. (2004). Multidisciplinary strategies for the management of heart failure patients at high risk for admission: A systematic review of randomized trials. *Journal of the American College of Cardiology, 44*, 810-819.

McCance, K., & Huether, S. (2006). *Pathophysiology: The biologic basis for disease in adults and children* (5 ed.). St. Louis: Elsevier Mosby.

McEvoy, R. D. (2004). Obstructive sleep apnea and heart failure: Two unhappy bedfellows. *American Journal of Respiratory and Critical Care Medicine, 169* , 329-331.

McMurray, J., & Pfeffer, M. A. (2002a). New therapeutic options in congestive heart failure: Part I. *Circulation, 105*, 2099-2106.

McMurray, J., & Pfeffer, M. A. (2002b). New therapeutic options in congestive heart failure: Part II. *Circulation, 105*, 2223-2228.

Meeberg, G. A. (1993). Quality of life: A concept analysis. *Journal of Advanced Nursing, 18*, 32-38.

Mehta, P. A., & Cowie, M. R. (2006). Gender and heart failure: A population perspective. *Heart, 92*(Suppl. 3), iii14-18.

Miani, D., Rozbowsky, P., Gregori, D., Pilotto, L., Albanese, M. C., Fresco, C., et al. (2003). The Kansas City Cardiomyopathy Questionnaire: Italian transla tion and validation. *Italian Heart Journal, 4*, 620-626.

Montazeri, A., Gillis, C., & McEwen, J. (1996). Quality of life. Measuring quality of life

in oncology: Is it worthwhile? I. Meaning, purposes and controversies. *European Journal of Cancer Care, 5*, 159-167.

Morrell, M. J. (2003). Sleep and breathing in congestive heart failure. *Clinical Pulmonary Medicine, 10*, 170-176.

Munro, B. H. (2001). *Statistical methods for health care research* (4th ed.). Philadelphia, PA: Lippincott.

Myers, J., Zaheer, N., Quaglietti, S., Madhavan, R., Froelicher, V., & Heidenreich, P. (2006). Association of functional and health status measures in heart failure. *Journal of Cardiac Failure, 12*, 439-445.

National Heart Lung and Blood Institute. (2006, August 15). Obesity Education Initiative. Retrieved July 1, 2006, from http://www.nhlbisupport.com/bmi/.

Naughton, M. T. (2003). Sleep disorders in patients with congestive heart failure. *Current Opinion in Pulmonary Medicine, 9*, 453-458.

Naughton, M. T. (2005). The link between obstructive sleep apnea and heart failure: Underappreciated opportunity for treatment. *Current Cardiology Reports, 7*, 211-215.

Newman, A. B., Spiekerman, C., Enright, P., Lefkowitz, D., Manolio, T., Reynolds, C., et al. (2000). Daytime sleepiness predicts mortality and cardiovascular disease in older adults. *Journal of American Geriatric Society, 48*, 115-123.

Nieminen, M. S., Brutsaert, D., Dickstein, K., Drexler, H., Follath, F., Harjola, V. -P., et al. (2006). EuroHeart Failure Survey II (EHFS II): a survey on hospitalized acute heart failure patients: description of population. *European Heart Journal, 27*, 2725-2736.

Nieminen, M. S., & Harjola, V.-P. (2005). Definition and epidemiology of acute heart failure syndromes. *The American Journal of Cardiology, 96* (6A), 5G-10G.

Nomura, K., Yamaoka, K., Nakao, M., & Yano, E. (2005). Impact of insomnia on individual health dissatisfaction in Japan, South Korea, and Taiwan. *Sleep, 28*, 1328-1332.

Norusis, M. (2004). *SPSS 12.0 guide to data analysis*. Upper Saddle River, New Jersey: Prentice Hall.

Ohayon, M. M., Caulet, M., Philip, P., Guilleminault, C., & Priest, R. G. (1997). How sleep and mental disorders are related to complaints of daytime sleepiness. *Archives of Internal Medicine, 157*, 2645-2652.

Ohayon, M. M., Zulley, J., Guilleminault, C., Smirne, S., & Priest, R. G. (2001). How age and daytime activities are related to insomnia in the general population: Consequences for older people. *Journal of the American Geriatrics Society, 49*, 360-366.

Oleson, M. (1990). Subjectively perceived quality of life. *Image--The Journal of Nursing Scholarship, 22*, 187-190.

Ormel, J., Lindenberg, S., Steverink, N., & Vonkorff, M. (1997). Quality of life and social production functions: A framework for understanding health effects. *Social Science & Medicine, 45*, 1051-1063.

Parissis, J. T., Adamopoulos, S., Rigas, A., Kostakis, G., Karatzas, D., Venetsanou, K., et al. (2004). Comparison of circulating proinflammatory cytokines and soluble apoptosis mediators in patients with chronic heart failure with versus without symptoms of depression. *The American Journal of Cardiology, 94*, 1326-1328.

Parissis, J. T., Fountoulaki, K., Paraskevaidis, I., & Kremastinos, D. (2005). Depression in chronic heart failure: novel pathophysiological mechanisms and therapeutic approaches. *Expert Opinion on Investigational Drugs, 14*, 567-577.

Parker, K. P., & Dunbar, S. B. (2002). Sleep and Heart Failure. *Journal of Cardiovascular*

Nursing, 17, 30-41.

Parmley, W. W. (1992). Pathophysiology of congestive heart failure . *Clinical Cardiology, 15*(Suppl. 1), I5-12.

Patel, A. R., & Konstam, M. A. (2001). Assessment of the patient with heart failure. In M. H. Crawford & J. P. DiMarco (Eds.), *Cardiology* (pp. 5.2.1-5.2.10). London: Mosby.

Patrick, D. L., & Chiang, Y. P. (2000). Glossary health outcomes methodology. *Medical Care, 38*(9 Suppl.), II7-13.

Patton, M. Q. (2002). *Qualitative research & evaluation methods* (3rd ed.). Thousand Oaks, CA: Sage.

Pepin, J.-L., Chouri-Pontarollo, N., Tamisier, R., & Levy, P. (2006). Cheyne -Stokes respiration with central sleep apnoea in chronic heart failure: Proposals for a diagnostic and therapeutic strategy. *Sleep Medicine Reviews, 10*, 33-47.

Pettersen, K. I., Reikvam, A., Rollag, A., & Stavem, K. (2005). Reliability and validity of the Kansas City Cardiomyopathy Questionnaire in patients with previous myocardial infarction. *European Journal of Heart Failure, 7*, 235-242.

Piano, M. R., & Prasun, M. (2003). Neurohormone activation. *Critical Care Nursing Clinics of North America, 15*, 413-421.

Pillar, G., Bar, A., Betito, M., Schnall, R. P., Dvir, I., Sheffy, J., et al. (2003). An automatic ambulatory device for detection of AASM defined arousals from sleep: The WP100. *Sleep Medicine, 4*, 207-212.

Plach, S. K., Napholz, L., & Kelber, S. T. (2001). Differences in anxiety and role experiences between three age groups of women with heart disease. *Archives of Psychiatric Nursing, 15*(4), 195-199.

Podrid, P. J., & Myerburg, R. J. (2005). Epidemiology and stratification of risk for sudden

cardiac death. *Clinical Cardiology, 28*(11 Suppl 1), I3-21.

Polit, D. F., & Beck, C. T. (2004). *Nursing research: Principles and methods* (7 ed.). Philadelphia, PA: Lippincott Williams & Wilkins.

Power, M. (2003). Chapter 10 development of a common instrument for QOL. In A. Nosikov & C. Gudex (Eds.), *EUROHIS: Developing common instruments for health surveys* (pp. 145-163). Geneva, Switzerland: WHO.

Principe-Rodriguez, K., Strohl, K. P., Hadziefendic, S., & Pina, I. L. (2005). Sleep symptoms and clinical markers of illness in patients with heart failure. *Sleep & Breathing 9*, 127-133.

Radford, M. J., Arnold, J. M. O., Bennett, S. J., Cinquegrani, M. P., Cleland, J. G. F., Havranek, E. P., et al. (2005). ACC/AHA key data elements and definitions for measuring the clinical management and outcomes of patients with chronic heart failure: A report of the American College of Cardiology/American Heart Association Task Force on Clinical Data Standards (Writing Committee to Develop Heart Failure Clinical Data Standards): Developed in collaboration with the American College of Chest Physicians and the International Society for Heart and Lung Transplantation: endorsed by the Heart Failure Society of America. *Circulation, 112*, 1888-1916.

Rao, A., Georgiadou, P., Francis, D. P., Johnson, A., Kremastinos, D. T., Simonds, A. K., et al. (2006). Sleep-disordered breathing in a general heart failure population: Relationships to neurohumoral activation and subjective symptoms. *Journal of Sleep Research, 15*, 81-88.

Rao, A., & Gray, D. (2005). Impact of heart failure on quality of sleep. *Postgraduate Medical Journal, 81*, 99-102.

Rector, T. S., Kubo, S. H., & Cohn, J. N. (1987). Patients' self-assessment of their

congestive heart failure. Part II: Content, reliability and validity of a new measure, the Minnesota Living with Heart Failure questionnaire. *Heart Failure, 3*, 198-209.

Rector, T. S., Tschumperlin, L. K., Kubo, S. H., Bank, A. J., Francis, G. S., McDonald, K. M., et al. (1995). Use of the Living with Heart Failure questionnaire to ascertain patients' perspectives on improvement in quality of life versus risk of drug-induced death. *Journal of Cardiac Failure, 1*, 201-206.

Reddy, P., & Dunn, A. B. (2000). The effect of beta-blockers on health-related quality of life in patients with heart failure. *Pharmacotherapy, 20*, 679-689.

Redeker, N. S., & Hilkert, R. (2005). Sleep and quality of life in stable heart failure. *Journal of Cardiac Failure, 11*, 700-704.

Redeker, N. S., & Stein, S. (2006). Characteristics of sleep in patients with stable heart failure versus a comparison group. *Heart & Lung, 35*, 252-261.

Remme, W. J., & Swedberg, K. (2001). Guidelines for the diagnosis and treatment of chronic heart failure. *European Heart Journal, 22*, 1527-1560.

Rhodes, D. L., & Bowles, C. L. (2002). Heart failure and its impact on older women's lives. *Journal of Advanced Nursing, 39*, 441-449.

Riedinger, M. S., Dracup, K. A., & Brecht, M. (2002). Quality of life in women with heart failure, normative groups, and patients with other chronic conditions. *American Journal of Critical Care, 11*, 211-219.

Riedinger, M. S., Dracup, K. A., & Brecht, M. L. (2000). Predictors of quality of life in women with heart failure. SOLVD Investigators. Studies of Left Ventricular Dysfunction. *Journal of Heart and Lung Transplantation, 19*, 598-608.

Riegel, B., & Carlson, B. (2002). Facilitators and barriers to heart failure self-care. *Patient Education and Counseling, 46*, 287-295.

Rockwell, J., & Riegel, B. (2001). Predictors of self-care in persons with heart failure.

Heart & Lung, 30, 18-25.

Rosamond, W., Flegal, K., Friday, G., Furie, K., Go, A., Greenlund, K., et al. (2007). Heart Disease and Stroke Statistics--2007 Update: A Report From the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. *Circulation, 115*(5), e69-171.

Rostagno, C., Olivo, G., Comeglio, M., Boddi, V., Banchelli, M., Galanti, G., et al. (2003). Prognostic value of 6-minute walk corridor test in patients with mild to moderate heart failure: Comparison with other methods of functional evaluati on. *European Journal of Heart Failure, 5*, 247-252.

Roth, T. (2004). Characteristics and determinants of normal sleep. *Journal of Clinical Psychiatry, 65*, 8-11.

Rumsfeld, J. S., Havranek, E., Masoudi, F. A., Peterson, E. D., Jones, P., Tooley, J. F., et al. (2003). Depressive symptoms are the strongest predictors of short -term declines in health status in patients with heart failure. *Journal of the American College of Cardiology, 42*, 1811-1817.

Rutledge, T., Reis, V. A., Linke, S. E., Greenberg, B. H., & Mil ls, P. J. (2006). Depression in heart failure a meta-analytic review of prevalence, intervention effects, and associations with clinical outcomes. *Journal of The American College of Cardiology, 48*, 1527-1537.

Ryan, C. M., & Bradley, T. D. (2005). Periodici ty of obstructive seep apnea in patients with and without heart failure. *Chest, 127*, 536-542.

Sandelowski, M. (2000). Focus on research methods. Whatever happened to qualitative description? *Research in Nursing & Health, 23*, 334-340.

Sander, G. E., Wilklow, F. E., & Giles, T. D. (2004). Heart failure in diabetes mellitus: Causal and treatment considerations. *Minerva Cardioangiologica, 52*, 491-503.

Sanderson, J. E., & Tse, T.-f. (2003). Heart failure: A global disease requiring a global response. *Heart, 89*, 585-586.

Sartorius, N. (1987). Cross-cultural comparisons of data about quality of life: A sample of issues. In N. K. Aaronson & J. Beckmann (Eds.), *The quality of life of cancer patients* (pp. 19-24). New York: Raven Press.

Saul, L., & Shatzer, M. (2003). B-type natriuretic peptide testing for detection of heart failure. *Critical Care Nursing Quarterly, 26*, 35-39.

Schipper, H., Clinch, J., & Olweny, C. (1996). Quality of life studies: Definitions and conceptual issues. In B. Spilker (Ed.), *Quality of life and pharmacoeconomics in clinical trials* (2nd ed., pp. 11-24). Philadelphia, PA: Lippincott-Raven.

Scotto, C. J. (2005). The lived experience of adherence for patients with heart failure. *Journal of Cardiopulmonary Rehabilitation, 25*, 158-163.

Shammas, R. L., Khan, N. U. A., Nekkanti, R., & Movahed, A. (2007). Diastolic heart failure and left ventricular diastolic dysfunction: What we know, and what we don't know! *International Journal of Cardiology, 115*, 284-292.

Shang, C.-C. (2002). *The effectiveness of coping skills training in patients with heart failure.* Unpublished thesis, National Taipei Nursing College, Taipei.

Sherwood, A., Blumenthal, J. A., Trivedi, R., Johnson, K. S., O'Connor, C. M., Adams, K. F., Jr., et al. (2007). Relationship of depression to death or hospitalization in patients with heart failure. *Archives of Internal Medicine, 167*, 367-373.

Shih, S.-C. (2002). *Comparison of effectiveness between duration-increased exercise training and intensity-increased exercise training among patients with heart failure.* Unpublished thesis, Taipei Medical University, Taipei.

Shih, S.-C., Chiou, H.-C., Tsai, J.-C., Ou, L.-J., & Jeng, C. (2003). Compairson between Duration and Intensity-increased Exercise Training Programs among heart failure

patients. *Formosan Journal of Medicine, 7*, 20-30.

Shin, G., Tooley, J., Southworth, M., Dunlap, S., Boyer, J., & Johnson, N. (2001). Quality of life and patient preference as predictors for resource utilization among patients with heart failure: Interim analysis. *Value in Health, 4*(5), 101-102.

Sin, D. D., Fitzgerald, F., Parker, J. D., Newton, G., Floras, J. S., & Bradley, T. D. (1999). Risk factors for central and obstructive sleep apnea in 450 men and women with congestive heart failure. *American Journal of Respiratory and Critical Care Medicine, 160*, 1101-1106.

Sin, D. D., Fitzgerald, F., Parker, J. D., Newton, G. E., Logan, A. G., Floras, J. S., et al. (2003). Relationship of systolic BP to obstructive sleep apnea in patients with heart failure. *Chest., 123*, 1536-1543.

Sinha, A.-M., Skobel, E. C., Breithardt, O.-A., Norra, C., Markus, K. U., Breuer, C., et al. (2004). Cardiac resynchronization therapy improves central sleep apnea and Cheyne-Stokes respiration in patients with chronic heart failure. *Journal of the American College of Cardiology, 44*, 68-71.

Skobel, E., Norra, C., Sinha, A., Breuer, C., Hanrath, P., & Stellbrink, C. (2005). Impact of sleep-related breathing disorders on health-related quality of life in patients with chronic heart failure. *European Journal of Heart Failure, 7*, 505-511.

Smith, B., Forkner, E., Zaslow, B., Krasuski, R. A., Stajduhar, K., Kwan, M., et al. (2005). Disease management produces limited quality-of-life improvements in patients with congestive heart failure: evidence from a randomiz ed trial in community-dwelling patients. *The American Journal of Managed Care, 11*, 701-713.

Smith, K. W., Avis, N. E., & Assmann, S. F. (1999). Distinguishing between quality of life and health status in quality of life research: A meta-analysis. *Quality of Life*

Research, 8, 447-459.

Solin, P., Kaye, D. M., Little, P. J., Bergin, P., Richardson, M., & Naughton, M. T. (2003). Impact of sleep apnea on sympathetic nervous system activity in heart failure. *Chest, 123*, 1119-1126.

Soto, G. E., Jones, P., Weintraub, W. S., Krumholz, H. M., & Spertus, J. A. (2004). Prognostic value of health status in patients with heart failure after acute myocardial infarction. *Circulation, 110*, 546-551.

Spertus, J. (2003). Appendix A: Overview of the Kansas City Cardiomyopathy Questionnaire and its attributes.

Spertus, J., Peterson, E., Conard, M. W., Heidenreich, P. A., Krumholz, H. M., Jones, P., et al. (2005). Monitoring clinical changes in patients with heart failure: A comparison of methods. *American Heart Journal, 150*, 707-715.

Spertus, J. A., Green, C. P., Porter, C. B., & Bresnahan, D. R. (2000). The Kansas City Cardiomyopathy Questionnaire predicts heart failure admissions and death. *Journal of American College Cardiology, 35*, 341A.

Spieker, E., & Motzer, S. (2003). Sleep-disordered breathing in patients with heart failure: Pathophysiology, assessment, and management. *Journal of the American Academy of Nurse Practitioners, 15*, 487-493.

Spilker, B. (1996). Introduction. In B. Spilker (Ed.), *Quality of life and pharmacoeconomics in clinical trials* (2 ed., pp. 1-10). Philadelphia, PA: Lippincott-Raven.

SPSS Inc. (2005). SPSS 14.0 for Windows. Chicago, Illinois: SPSS Inc.

Sredl, D. (2004). Health related quality of life: A concept analysis. *West African Journal of Nursing, 15*, 9-19.

Stanek, E. J., Oates, M. B., McGhan, W. F., Denofrio, D., & Loh, E. (2000). Preferences

for treatment outcomes in patients with heart failure: Symptoms versus survival. *Journal of Cardiac Failure, 6*, 225-232.

Steinhauser, K. E., Bosworth, H. B., Clipp, E. C., McNeilly, M., Christakis, N. A., Parker, J., et al. (2002). Initial assessment of a new instrument to measure quality of life at the end of life. *Journal of Palliative Medicine, 5*, 829-841.

Stewart, S., Marley, J. E., & Horowitz, J. D. (1999). Effects of a multidisciplinary, home-based intervention on planned readmissions and survival among patients with chronic congestive heart failure: A randomised controlled study. *The Lancet, 354*, 1077-1083.

Streiner, D., & Norman, G. (2003). *Health measurement scales: A practical guide to their development and use* (2 ed.). New York: Oxford University Press.

Stull, D. E., Clough, L. A., & Van Dussen, D. (2001). Self-report quality of life as a predictor of hospitalization for patients with LV dysfunction: a life course approach. *Research in Nursing & Health, 24*, 460-469.

Su, T.-P., Huang, S.-R., & Chou, P. (2004). Prevalence and risk factors of insomnia in community-dwelling Chinese elderly: a Taiwanese urban area survey. *The Australian and New Zealand Journal of Psychiatry, 38*, 706-713.

Subramanian, U., Weiner, M., Gradus-Pizlo, G., Wu, J., Tu, W., & Murray, M. D. (2005). Patient perception and provider assessment of severity of heart failure as predictors of hospitalization. *Heart & Lung, 34*, 89-98.

Taiwan Department of Health. (2005). *Health and vital statistics*. Taipei: Department of Health, Executive Yuan, Taiwan.

Taiwan Department of Health. (2006). Health and vital statistics. Retrieved July 1, 2006, from http://www.doh.gov.tw/statistic/data/.

Tendera, M. (2004). The epidemiology of heart failure. *Journal of the*

Renin-Angiotensin-Aldosterone System, 5(Suppl. 1), S2-6.

The Criteria Committee of the AHA. (1994). Nomenclature and Criteria for Diagnosis of Diseases of the Heart and Great Vessels. In *The Criteria Committee of the New York Heart Association* (9 ed.). Boston, Mass: Little, Brown & Co.

The WHOQOL Group. (1998). Development of the World Health Organization WHOQOL-BREF quality of life assessment. *Psychological Medicine, 28*, 551-558.

Thom, T., Haase, N., Rosamond, W., Howard, V. J., Rumsfeld, J., Manolio, T., et al. (2006). Heart disease and stroke statistics--2006 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee [Electronic Version]. *Circulation*, 113, e85-151. Retrieved 2006 Sep 10 from http://www.lib.utexas.edu:2048/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=cmedm&AN=16407573&site=ehost-live

Todero, C. M., LaFramboise, L. M., & Zimmerman, L. M. (2002). Symptom status and quality-of-life outcomes of home-based disease management program for heart failure patients. *Outcomes Management, 6*, 161-168.

Tresch, D. D., & McGough, M. F. (1995). Heart failure with normal systolic function: a common disorder in older people. *Journal of the American Geriatrics Society, 43*, 1035-1042.

Trochim, W. K. (2001). *Research method: Knowledge base* (2 ed.). Cincinnati, OH: Atomic Dog Publishing.

Trupp, R. (2004). The heart of sleep: Sleep-disordered breathing and heart failure. *Journal of Cardiovascular Nursing, 19*, S67-S74.

Trupp, R. J., Hardesty, P., Osborne, J., Shelby, S., Lamba, S., Ali, V., et al. (2004). Prevalence of sleep disordered breathing in a heart failure program. *Congestive*

Heart Failure, 10, 217-220.

Tsai, P.-S., Wang, S.-Y., Wang, M.-Y., Su, C.-T., Yang, T.-T., Huang, C.-J., et al. (2005). Psychometric evaluation of the Chinese version of the Pittsburgh Sleep Quality Index (CPSQI) in primary insomnia and control subjects. *Quality of Life Research, 14*, 1943-1952.

Tsai, S.-Y., Chi, L.-Y., Lee, L. S., & Chou, P. (2004). Health-related quality of life among urban, rural, and island community elderly in Taiwan. *Journal of the Formosan Medical Association, 103*, 196-204.

Tsay, S.-L., & Chao, Y.-F. C. (2002). Effects of perceived self-efficacy and functional status on depression in patients with chronic heart failure. *Journal of Nursing Research, 10*, 271-278.

Tsay, S.-L., Rong, J.-R., & Lin, P.-F. (2003). Acupoints massage in improving the quality of sleep and quality of life in patients with end-stage renal disease. *Journal of Advanced Nursing, 42*, 134-142.

Tseng, W.-K. (2004). *The relationship between length of stay and clinical outcome in heart failure patients--a regional hospital experience.* Unpublished thesis, China Medical University, Taichung, Taiwan.

US Department of Health and Human Services. (2000). Healthy People 2010: Understanding and Improving Health. Retrieved April 2, 2005, from http://www.healthypeople.gov/Document/pdf/uih/2010uih.pdf

Van Cheng, B. S., Kazanagra, R., Garcia, A., Lenert, L., Krishnaswamy, P., Gardetto, N., Clopton, P., & Maisel, A. (2001). A rapid bedside test for B-type peptide predicts treatment outcomes in patients admitted for decompensated heart failure: A pilot study. *Journal of American College of Cardiology, 37*, 386-391.

van der Steeg, A. F. W., De Vries, J., & Roukema, J. A. (2004). Quality of life and health

status in breast carcinoma. *European Journal of Surgical Oncology, 30*, 1051-1057.

van Jaarsveld, C. H. M., Ranchor, A. V., Kempen, G. I. J. M., Coyn e, J. C., van Veldhuisen, D. J., & Sanderman, R. (2006). Epidemiology of heart failure in a community-based study of subjects aged >= 57 years: Incidence and long -term survival. *European Journal of Heart Failure, 8*, 23-30.

Vena, C., Parker, K. P., Allen, R., Bliwise, D. L., Jain, S., & Kimble, L. (2006). Sleep-wake disturbances and quality of life in patients with advanced lung cancer. *Oncology Nursing Forum, 33*, 761-769.

Ventura, H. O., Potluri, S., & Mehra, M. R. (2003). The conundrum of sleep breathing disorders in heart failure. *Chest., 123*, 1332-1334.

Villa, M., Lage, E., Quintana, E., Cabezon, S., Moran, J. E., Martinez, A., et al. (2003). Prevalence of sleep breathing disorders in outpatients on a heart transplant waiting list. *Transplantation Proceedings, 35*, 1944-1945.

Walter, S. J., Munro, J. F., & Brazier, J. E. (2001). Using the SF -36 with older adults: a cross-sectional community based survey. *Age and Ageing, 30*, 337-343.

Wang, F.-T. (2005). *Quality of life, self-care behavior and social support in patients with heart failure.* Unpublished thesis, National Yang-Ming University, Taipei.

Wang, H. (2001). A comparison of two models of health -promoting lifestyle in rural elderly Taiwanese women. *Public Health Nursing, 18*, 204-211.

Wang, P.-C., Li, H.-Y., Shih, T.-S., Gliklich, R. E., Chen, N.-H., & Liao, Y.-F. (2006). Generic and specific quality-of-life measures in Taiwanese adults with sleep-disordered breathing. *Otolaryngology--Head and Neck Surgery, 135*, 421-426.

Wang, R.-C., Wang, S.-J., Chang, Y.-C., & Lin, C.-C. (2007). Mood state and quality of

sleep in cancer pain patients: a comparison to chronic daily headache. *Journal of Pain and Symptom Management, 33*, 32-39.

Wang, S. P. (2004). *The effectiveness of self-care program in improving symptom distress and quality of life of patients with congestive heart failure.* Unpublished thesis, National Yang-Ming University, Taipei.

Wang, Y. H. (2003). *Development of the congestive heart failure Symptom Distress Experience Scale in Taiwan.* Unpublished Thesis, Chang Gung University Taoyuan.

Ware, J., Kosinski, M., & Keller, S. D. (1996). A 12-Item Short-Form Health Survey: Construction of scales and preliminary tests of reliability and validity. *Medical Care, 34*, 220-233.

Ware, J. E., Jr. (1987). Standards for validating health measures: Definition and content. *Journal of Chronic Diseases, 40*, 473-480.

Ware, J. E., Jr, & Sherbourne, C. D. (1992). The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Medical Care, 30*, 473-483.

Wassem, R., & Dudley, W. (2003). Symptom management and adjustment of patients with multiple sclerosis: a 4-year longitudinal intervention study. *Clinical Nursing Research, 12*, 102-117.

Wen, H.-C., Tang, C.-H., Lin, H.-C., Tsai, C.-S., Chen, C.-S., & Li, C.-Y. (2006). Association between surgeon and hospital volume in coronary artery bypass graft surgery outcomes: a population-based study. *The Annals of Thoracic Surgery, 81*, 835-842.

Wenger, N. (1989). Quality of life: Can it and should it be assessed in patients with heart failure. *Cardiology, 76*, 391-398.

Westlake, C., Dracup, K., Creaser, J., Livingston, N., Heywood, J. T., Huiskes, B. L., et al.

(2002). Correlates of health-related quality of life in patients with heart failure. *Heart & Lung, 31*, 85-93.

Whitney, C. W., Enright, P. L., Newman, A. B., Bonekat, W., Foley, D., & Quan, S. F. (1998). Correlates of daytime sleepiness in 4578 elderly persons: The Cardiovascular Health Study. *Sleep, 21*, 27-36.

Wiklund, I., Lindvall, K., Swedberg, K., & Zupkis, R. V. (1987). Self-assessment of quality of life in severe heart failure: An instrument for clinical use. *Scandinavian Journal of Psychology, 28*, 220-225.

Wilhelmsen, L., Rosengren, A., Eriksson, H., & Lappas, G. (2001). Heart failure in the general population of men--morbidity, risk factors and prognosis. *Journal of Internal Medicine, 249*, 253-261.

Wilson, I. B., & Cleary, P. D. (1995). Linking clinical variables with health-related quality of life. A conceptual model of patient outcomes. *JAMA : The Journal of the American Medical Association, 273*, 59-65.

World Health Organization. (1948). *Constitution of the World Health Organization*. Geneva World Health Organization.

Wu, E. B., & Yu, C. M. (2005). Management of diastolic heart failure -- a practical review of pathophysiology and treatment trial data. *International Journal of Clinical Practice, 59*, 1239-1246.

Yamashiro, Y., & Kryger, M. (1993). Review: Sleep in heart failure. *Sleep, 16*, 513-523.

Yang, M.-H. (2000). *The influence of exercise tolerance on quality of life among patients with congestive heart failure.* Unpublished thesis, Taipei Medical University, Taipei.

Yao, G. K.-P. (2000). Critiques on six generic health-related quality of life scales and suggestions on the further studies. *Psychological Testing, 47*, 111-138.

Young, J. B. (2004). The global epidemiology of heart failure. *The Medical Clinics of North America, 88*, 1135-1143.

Youngstedt, S. D., & Kripke, D. F. (2004). Long sleep and mortality: Rationale for sleep restriction. *Sleep Medicine Reviews, 8*, 159-174.

Yu, D. S. F., Lee, D. T. F., & Woo, J. (2004). Health-related quality of life in elderly Chinese patients with heart failure. *Research in Nursing & Health, 27*, 332-344.

Yu, H.-J., Chen, F.-Y., Huang, P.-C., Chen, T. H.-H., Chie, W.-C., & Liu, C.-Y. (2006). Impact of nocturia on symptom-specific quality of life among community-dwelling adults aged 40 years and older. *Urology, 67*, 713-718.

Yu, H.-Y., Tang, F.-I., Kuo, B. I.-T., & Yu, S. (2006). Prevalence, interference, and risk factors for chronic pain among Taiwanese community older people. *Pain Management Nursing, 7*, 2-11.

Zambroski, C. H. (2003). Qualitative analysis of living with heart failure. *Heart & Lung, 32*, 32-40.

Zambroski, C. H., Moser, D. K., Bhat, G., & Ziegler, C. (2005). Impact of symptom prevalence and symptom burden on quality of life in patients with heart failure. *European Journal of Cardiovascular Nursing, 4*, 198-206.

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